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MAGAZINE

DECEMBER 17, 1991

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING

VOLUME 10 NUMBER 21

SOFTWARE

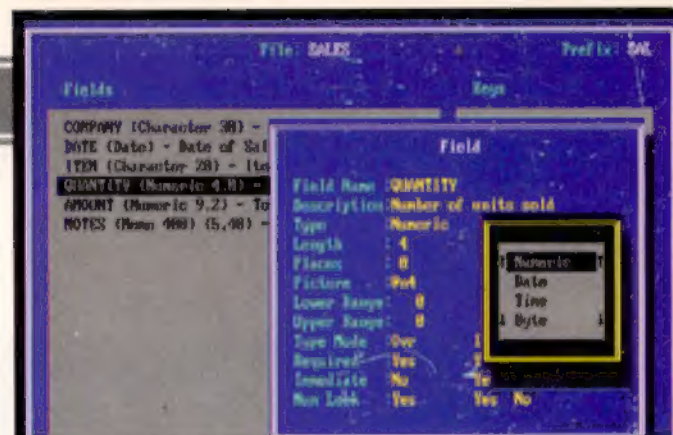
**Do-It-Yourself
Databases: Powerful
Applications
Without Programming**

SOFTWARE

**Org Chart Programs
Can Get Your
Company
Down on Paper**

COMPUTERS

**Are the New Home
PCs Worthwhile? We
Review the PS/1 and
Five Others**

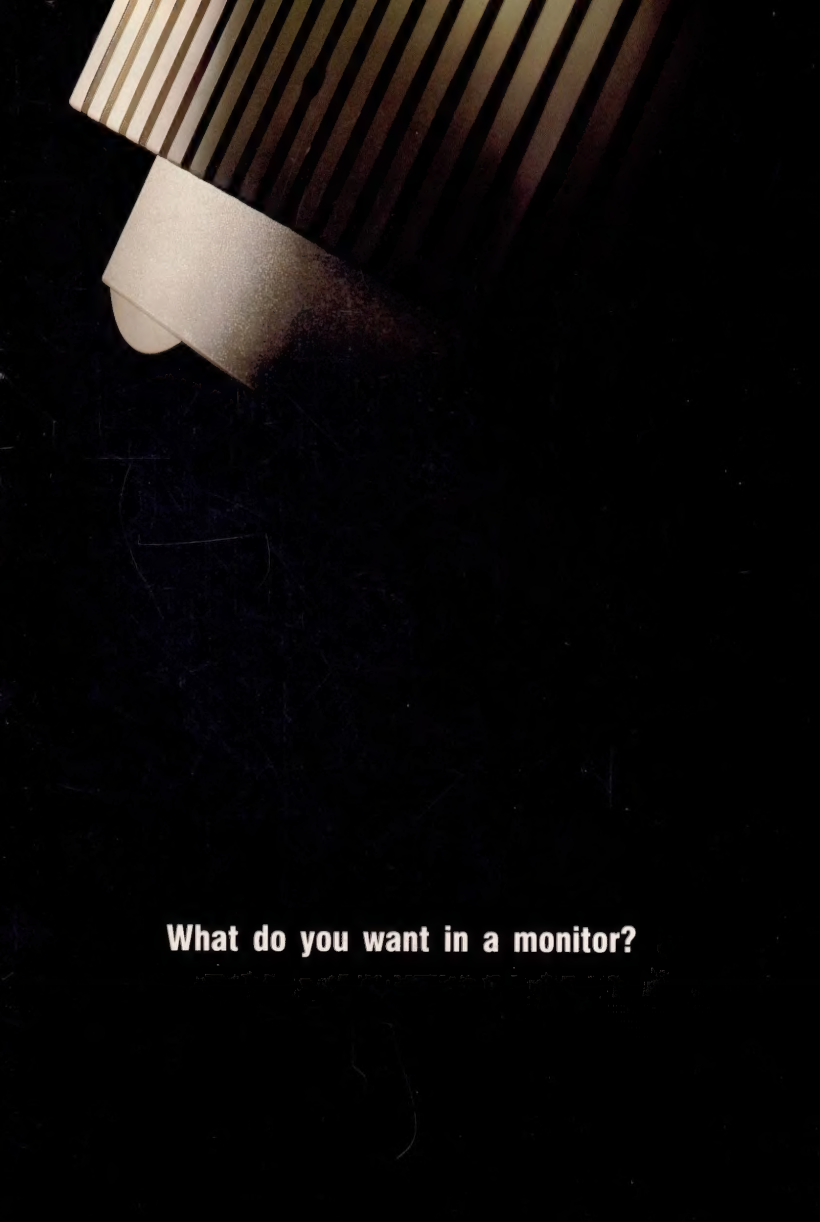


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people have chosen the Microsoft Mouse as their personal Windows computing guide.

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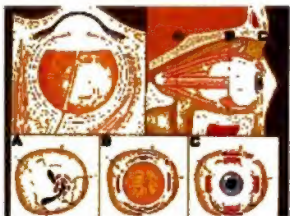
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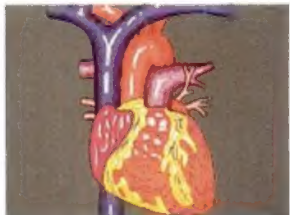
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**Software
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Inside

Finding the words to accurately describe PC software is part of our job at *PC Magazine*, and it's never easy.

When we planned the database coverage that appears in this issue, we knew precisely the kinds of products we wanted to test. *Q&A* and *PC-File* had just released new versions, and we needed to test them. Plus Microrim and Clarion had introduced "personal" versions of their programmable relational databases, and we wanted to compare them to similar products. And we'd been very impressed with the ease of developing applications in *Alpha 4*.

The kinds of products that we were talking about used to be called nonprogrammable databases—yet many have added application generators. They also have been called flat-file databases, in order to distinguish them from relational products—yet many have added relational features.

The job of creating the new labels was given to Joe Salemi, a writer whose work is appearing in the magazine with increasing frequency.

Salemi first became involved with *PC Magazine* as an assistant sysop (system operator) for *PC MagNet*, where he bartered librarian work for a break on his connect-time charges. His work as a LAN installation project leader at the National Cancer Institute gave him firsthand experience with a

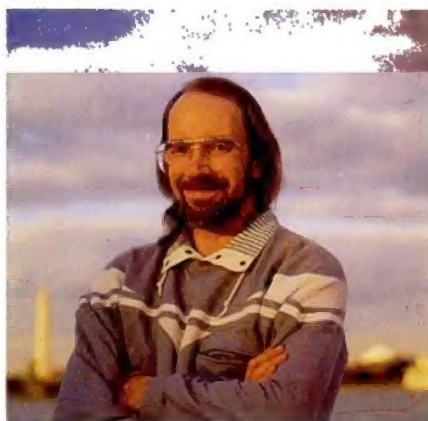


number of the connectivity products that our First Looks editor, Robin Raskin, needed to test, so Salemi began to write reviews soon after he began working with *MagNet*.

In April, I turned the Advisor column over to him, and soon after Salemi quit his job to devote all of his time to writing.

He began his career in computing as a writer of IBM mainframe documentation, following early retirement from his post as a Fair Lawn, New Jersey, police officer in 1980.

Since then, Salemi's been exposed to just about every aspect of PC software development. He has run his own consulting business (installing XTs with *WordStar* and *PFS:File* in the early eight-



Joe Salemi, our Washington D.C.-based Advisor.

ies), and graduated to act as the network manager on large institutional projects, ranging from Novell to *3+Open*, for a Washington, D.C. area hospital management company.

When Salemi is working on a *PC Labs* project (which is often), he commutes from his Alexandria, Virginia home to our New York City offices.

The magazine is keeping Salemi very busy these days. In addition to the database story, he also was a key contributor to the Connectivity feature.

In the future, you'll read Salemi's work on multiuser databases, V.32bis modems and Token-Ring adapters. And, of course, the Advisor column every issue.—Gus Venditto ■

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	LPs	CDs	Tapes	Total
Units	19,499	34,678	23,597	77,774
Price	\$0.75	\$1.40	\$1.05	\$0.73
Sales	\$14,624	\$48,549	\$24,777	\$87,950
COGS	\$13,671	\$24,314	\$16,544	\$54,529
SG&A	\$1,462	\$4,855	\$2,478	\$8,795
Total Cost	\$15,134	\$29,168	\$19,022	\$63,324
Profits	(\$509)	\$19,381	\$5,755	\$24,627

Eastern Forecast - Pdt A

LPs East Plan

	1989	1990	1991	1992
% Sales	100.00%	100.00%	100.00%	100.00%
Sales	100.00%	100.00%	100.00%	100.00%
COGS	81.57%	79.63%	77.77%	77.77%
SG&A	12.00%	12.00%	12.00%	12.00%
Total Cost	93.57%	91.63%	89.77%	89.77%
Profits	6.43%	8.37%	10.23%	10.23%
Tax	2.70%	3.52%	4.30%	4.30%
Net Income	3.73%	4.85%	5.93%	5.93%

Variance Report by Product Eastern Region -- 1989

	Actual	Plan	Variance
LPs			
Units	19,499	21,344	(1,845)
Price	\$0.75	\$0.75	\$0.00
Sales	\$14,624	\$16,008	(\$1,384)
Cost of Goods Sold	\$13,671	\$13,058	\$613
Selling & Admin.	\$1,462	\$1,921	(\$459)
Total Cost	\$15,134	\$14,979	\$155
Profits	(\$509)	\$1,029	(\$1,539)

CDs

	Actual	Plan	Variance
Units	34,578	30,200	4,478
Price	\$1.40	\$1.40	\$0.00
Sales	\$48,549	\$42,280	\$6,269
Cost of Goods Sold	\$24,314	\$18,476	\$5,838
Selling & Admin.	\$4,855	\$5,074	(\$219)
Total Cost	\$29,168	\$23,549	\$5,619
Profits	\$19,381	\$18,731	\$650

Tapes

	Actual	Plan	Variance
Units	23,597	26,100	(2,503)

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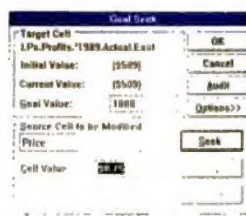
Audit (Product Actuals - 1989)

LPs	Units	Price	Sales	COGS	SG&A	Total Cost	Profits
1989	19,499	\$0.75	\$14,624	\$13,671	\$1,462	\$15,134	(\$509)
1990	21,344	\$0.75	\$16,008	\$13,058	\$1,921	\$14,979	\$1,029
1991	23,597	\$0.75	\$17,698	\$12,448	\$2,478	\$15,134	\$2,554

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With the new Apple OneScanner, just one mouse-click gives you a perfect gray-scale scan. No fiddling, adjusting or guesstimating required.

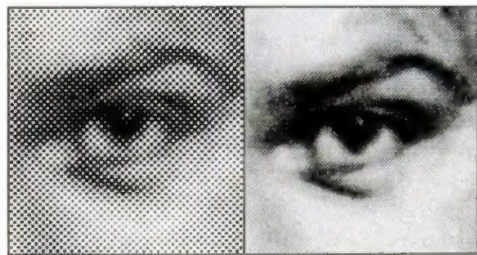
All you need is the new Apple® OneScanner™, the new LaserWriter® IIf printer or LaserWriter IIfx printer and any one of our Apple Macintosh® personal computers.

The Apple OneScanner is a 300-dpi, 256-level gray-scale scanner that, combined with the new Ofoto™ software (included), offers several breakthroughs in the scanning process.

Just pop a photograph on the scanner. (Don't bother to straighten it.) Point to Autoscan. Click your mouse once. Then sit back and relax.

The OneScanner automatically previews and evaluates the image you're scanning. It sets dpi and bit depths, adjusts the brightness and contrast, determines whether your image is a photograph, halftone or line art and generally determines how to get the best possible results from your printer. Then, only after it's done all of this for you, it actually scans your photo.

Once the scan reaches your Mac®, it automatically straightens and crops it to the image size.



*On the left, conventional laser printing. On the right, PhotoGrade, which intelligently adjusts the size and position of dots for noticeably sharper details and subtler grays.**

It's only one click. And you've got a perfect scan. (You can also tell the OneScanner to scan to fit a predetermined size, or rotate a scan to a preset angle. It gives you a new level of control over all the variables of scanning for really fine-tuning.)

While one group of Apple engineers was busy simplifying the process of getting images into your Macintosh, another group of Apple engineers was busy transforming the process of getting them out.

Introducing the Apple LaserWriter IIf and LaserWriter IIfx printers.



**SPORTS
IMAGES
OF THE
DECADE**

An exhibition of some of the most dramatic and captured by the world's top photographers. Now s

*Both images enlarged approximately 40%. **PhotoGrade is standard in the Apple LaserWriter IIf. It requires a 4 MB memory upgrade in the LaserWriter IIfx. ©1991 Apple Computer, Inc. Apple, the Apple logo, LaserWriter, Mac, Macintosh and "The power to the people" are registered trademarks of Apple Computer, Inc., registered in the United States and other countries. MS-DOS is a registered trademark of Microsoft Corp. PCL is a registered trademark of Hewlett-Packard Corp. By the way, this advertisement was printed on a LaserWriter IIfx.

leap in desktop by one small step.

They incorporate a new development in gray-scale printing technology called PhotoGrade.[™] A process that allows the size and position of every dot to be intelligently adjusted in relation to neighboring dots. This gives you noticeably sharper details, and the ability to accurately reproduce the subtle tones of gray in a black-and-white photograph. The end result: 300-dpi printers with print quality that rivals 800-dpi printers costing much more.

They also incorporate Apple's new FinePrint[™] technology. This gives your text and line art sharper edges and smoother curves. Your TrueType[™] and PostScript Type One fonts have never looked better.

For processing complex pages, they offer twice the performance of our workhorse LaserWriter II[™] and incorporate Adobe PostScript Level 2 page description language. You can crank up their performance even more by adding external hard drives and up to 32MB of memory.

On the left, an actual unretouched document that was created by an actual unretouched art director. You can do it, too.

The LaserWriter IIg also has built-in Ethernet for high-performance networks. Allowing you to move and print even the largest image files at warp speed.

If you work in an office with MS-DOS PCs, both printers fit right in. They support PCL page description language and can accept jobs simultaneously from different kinds of computers.

To see how great the Apple OneScanner and LaserWriter II[™] and IIg printers can make your work look, visit your authorized Apple reseller today, and find out how enjoyable and simple they really are. For the name of the reseller nearest you, call 800-538-9696, extension 325. And discover the power to look better than ever. The power to be your best.[®]



Introducing the Apple OneScanner, LaserWriter II[™] and LaserWriter IIg. Together, they set a whole new standard for print quality.



Introducing One-Step Scanning & PhotoGrade Printing.

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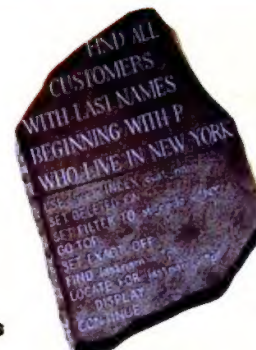
Jeff Prosize/ They don't have all the latest and greatest high-end features, but the best of our crop of low-cost 2-D CAD programs can do just about everything that most architects and engineers need. And some of these packages are easier to use, faster, and better than the top-of-the-line competition.

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Letters

PC TOOLS UPGRADE OR DOWNGRADE?

After reading much hoopla over *PC Tools* Version 7.0 (First Looks, September 10, 1991), I must toss my opinion into the fire. As a devoted (daily) Version 6.0 user, I jumped at the chance to upgrade this summer. After all, I have found little use for either *The Norton Utilities* or *Fastback Plus* since I first bought Version 6.0. Now I find a program that's just as slow, redundant, and boring as *Windows* itself! I even had to drop some TSRs to load it. The feature most missed is Version 6.0's ability to check disk space *before* copying or moving files. Needless to say, 7.0 is on the shelf and 6.0 is back, and now my world is once again complete.

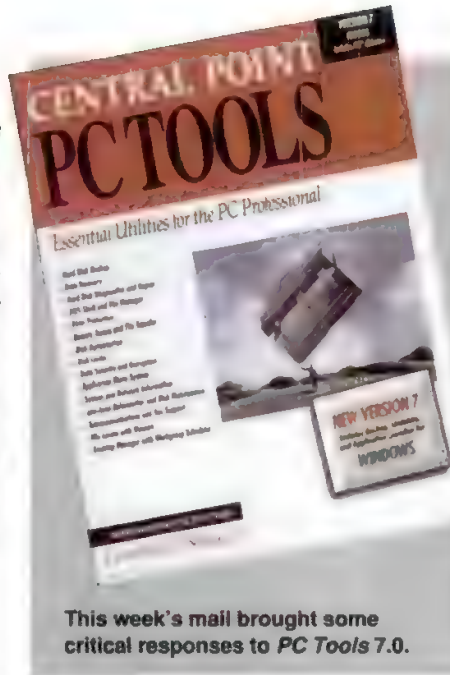
William Ihrig
Stigler, Oklahoma

PC Tools, Version 7.0, is one of the worst installations in the long history of these utilities. The screens are confused with excessive graphs. The number of buttons is also excessive. My opinion is that the program was parsed out to any number of ill-informed, unskilled people, and that Central Point apparently never bothered to hold any meeting to view, evaluate, and discuss the work of the individual programmers. Central Point should apologize to its users for such an inept, unprofessional product.

John P. Morgan
Sacramento, California

Once again, *PC Magazine* disappointed me. Its *PC Tools* review never mentioned any of the serious flaws in Version 7.0. Since I upgraded from 6.0 I've had numerous lock-ups and errors, including the DOS message "divide overflow." I believe this indicates logic flaws in programming. *PC Magazine* should learn a lesson from Gorb's recent experience and take care not to neglect the needs of its constituency. We may be ready for a revolt!

Louis V. Catucci
Brooklyn, New York



This week's mail brought some critical responses to *PC Tools* 7.0.

PC Magazine reviewers undoubtedly rate special and expeditious service from software vendors when they encounter difficulties using products. This is not the case for the average unsuspecting consumer, who pays good money for highly touted software only to discover that it doesn't operate as advertised.

I am an end user, not a beta tester. *PC Magazine* should tell the true story of a product's bugs, not give a glossy misconception of a defective product to help a vendor increase sales.

W. Curtis McLeod
El Cajon, California

SURGE SURPRISE

I can greatly appreciate John C. Dvorak's recent caveat regarding inadequate grounding and "hot cases" on computers (Inside Track, September 10, 1991). Last year I was working on a PS/2 Model 30, and I assumed that when I turned the surge protector off it would completely eliminate the possibility of there being any current in the machine. Not so! With the cover off, I placed one hand on the metal chassis and grabbed the coax

connector on the back of the emulation board and got "bitten" hard enough to knock me on my butt!

It turned out that someone had plugged the surge protector into a 25-foot heavy-duty extension cord in order to reach the only outlet in the office. I found that the ground prong on the extension cord had been broken off and the plug was reversed in the socket! So apparently, the neutral side of the line in a PS/2 power supply is connected in common directly with chassis ground. Caveat emptor!

Rich Gierman
Spreckels, California

SMALL BUSINESSES SHOULD...

I completely agree with Jim Seymour's "Where Small Business Goes Wrong" (September 10, 1991), and I want to mention an additional error that I have experienced. A good program should have good documentation, and even more important, very thorough and complete context-sensitive help. Buying software can be like buying a car: Never buy a brand-new model; wait two to three years until all the bugs are out and then buy it from a dealer close by that gives good service.

Jack J. Neymark
Glenview, Illinois

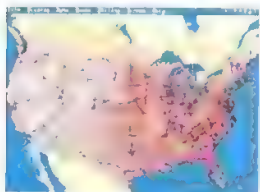
DON'T TAKE THINGS SO SERIOUSLY

I'm one of the two authors of the book you reviewed entitled *Stupid PC Tricks* (Read Only, August 1991). My basic response to your review is "Don't be so serious!" While we do concentrate on the lighter side of computing, Bob LeVitus and I are both careful to caution our readers to be responsible tricksters, and to help clean up any problems they may cause.

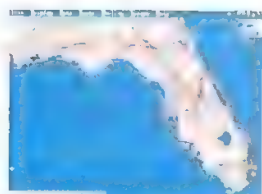
In addition, most of the tricks in the book are totally innocuous—things like bugle calls, screen blankers, and graphics toys—and couldn't be used for malicious ends in any case. Our goal in writing the book was to show how computers can be

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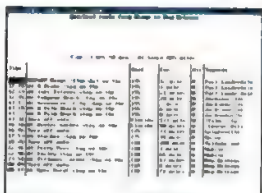
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Letters

used for fun and entertainment as well as for serious business pursuits. We'd like to encourage you to slow down and take some time to play with and savor the tricks in the book. Who knows, you may even end up having some fun!

Ed Tittel
Austin, Texas

UPGRADE BOOKS, TOO

It would be a good idea to let your subscribers know how we can upgrade books from different publishers, once a new version of a product comes out. It is foolish to have to pay full price for a new book when an application is upgraded. Computer book publishers should provide upgrades for their readers just as the software industry does.

Juane Placencia
Houston, Texas

MORE DOS 5.0 DISAPPOINTMENT

DOS 5.0 is not an easy upgrade from 3.3. *The Norton Utilities* 4.0 must be upgraded to 6.0 (which takes 5 times as much disk space as 4.0), and a new Logitech mouse driver is required. Logitech furnished the new driver for free, but that makes its utility software obsolete—which Logitech does not update for free. The new mouse driver is not compatible with my CAD software (*DesignCAD*). I've spent money, and much time and disk space only to lose capacity and productivity.

John Stewart
Orlando, Florida

WRITE ON TARGET

In Rubin Rabinovitz's review of *The Complete Writer's Toolkit* ("Write on Target: 15 Writer's Tools," September 24, 1991) he claims "it takes at least 25 seconds to execute a simple operation" on an AT. Surely the author meant "at most," since the specific times supplied to us by Rabinovitz total under 25 seconds. Also, the author did not make clear that by "simple operation" he meant every step from invoking a module through lookup, selection, insertion, and return to the user's application. As written, his remark gives the mistaken impression that a single step takes this long.

Rabinovitz's claim that *The Complete Writer's Toolkit* (among others) is "a collection of standalone packages" is inaccurate.

rate. All the tools are fully integrated into one TSR: they are loaded together, and the user may switch among them freely. Our grammar-checker, though not integrated, lets the user back up through the document to recheck or re-edit text that

There are now two
separate markets—text
and graphics—and they
each need a separate
marketing strategy.

has already been checked—a feature *PC Magazine* says is unique to *Power-Edit*. This is but one feature that makes our grammar-checker more than just a re-packaged standalone application.

Stuart Weiner
President, Systems Compatibility Corp.
Chicago, Illinois

PC The timings cited do indeed encompass the entire process of completing a lookup, not just waiting for the module to load. Some processes took less than 25 seconds on an AT-class machine, some took more.—Ed.

ATTENTION ALL SOFTWARE COMPANIES

I think your industry must realize that there are now two separate markets out there—text and graphics—and you must develop a separate marketing strategy for each.

Don Hallenbeck
Escondido, California

WHAT WE REALLY NEED

Your loyal readers need an in-depth review of the current crop of high-speed modems, with emphasis on the ones that really do meet the CCITT standards. The last thing anyone wants to do is invest \$500 to \$800 in a modem that can't move data faster than 2,400 bits per second unless it finds its evil twin somewhere.

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PC WEEK REVIEWS

February 1989



Tri-Star Leads 33MHz 486 PC Pack

Eight Low-Cost Systems Perform Well; Video and Hard-Disk Components Vary

By David Chabrowski

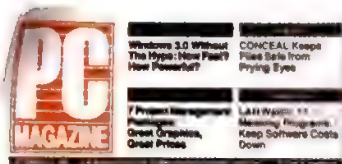
In a recent PC Week Labs product review, Tri-Star's 33MHz 486 Flash Cache system was named the top performer in its class.

PC Week Labs Inc. has completed its review of eight 33MHz 486 systems for the month of February 1989. The results are in, and Tri-Star's 33MHz 486 Flash Cache system is the top performer.

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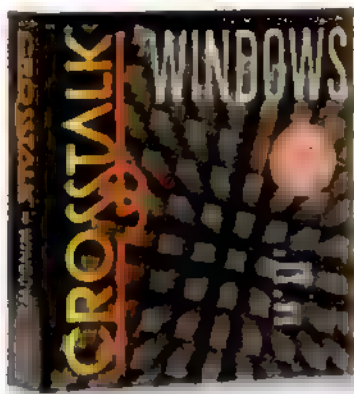
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- ★★ DynaComm Asynchronous Edition
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- ★★ MicroPhone II for Windows

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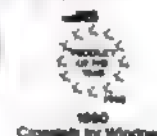
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Letters

LAPTOPS ARE LIKE AIRPLANES

I've just finished reading John C. Dvorak's analogy between computers and transportation ("The Last Analogy," September 10, 1991). It would seem to me that the equivalent of airplanes in the PC world would be laptop computers. Like aircraft transportation, laptops cost more than their alternatives but can be the best choice

Are only "market leaders" allowed to set new standards in the industry and not be considered outcasts?

where time is important. Users can work wherever they are, often using what would otherwise be wasted time (for example, while traveling).

Also, like airplanes, laptops are limited in what they can "carry." With hard disk space at a premium compared with what's available on large desktop units, one can only afford to use a laptop for work that requires its unique capabilities. Otherwise, you'll spend the time and put up with a slower, cheaper mode—the common desktop.

Paul F. Schikora
Rantoul, Illinois

TREAT ALL COMPANIES EQUALLY

I thought it was interesting to see the differences in the reviews of MS-DOS 5.0 and DR DOS 5.0. All the hoopla given to Microsoft's year-late offering does a disservice to Digital Research Inc. It makes me skeptical as to whether you are capable of impartial judgment. The same overglorification occurred when the Hewlett-Packard LaserJet III was introduced.

It was as if the offering from Canon (LBP-8) was never considered a serious alternative, even though it had similar capabilities almost a year earlier. Are only "market leaders" allowed to set new standards and not be considered outcasts?

Andrew Ackerman
Edwards AFB, California

How dare you call yourselves "the independent guide to personal computing." I was quite perturbed to see in Jeff Prosis's recent Tutor column (September 10, 1991), under the subheading of "A Better Command Line," a tutorial on the use of the DOSKEY utility in MS-DOS 5.0. No mention is made of Digital Research's DOS 5.0 command line, which is even better and doesn't require a memory-wasting program. Digital Research's command line replay is part of DOS and not a last-minute kludge.

As if this fallacy wasn't enough, I then turned the page and found out why the article was written. There is a two-page advertisement for a book written by Mr. Prosis himself with a foreword by Bill Machrone about using Microsoft's DOS 5.0. This book is published by Ziff-Davis Publishing Co., the publisher of *PC Magazine*. How can you call yourselves "independent" when your magazine, your writers, and your publisher stand to profit directly from the success of a single company's product?

Drew Harris
Linden, New Jersey



There are many command line editors currently available. Jeff Prosis has even written a command line editor himself, but DOSKEY is used by the majority. Furthermore, DR DOS 6.0 was reviewed in First Looks in the November 12, 1991, issue of *PC Magazine*.—Ed.

CORRECTIONS & AMPLIFICATIONS

In New & Improved (September 24, 1991), the phone number for GSI should have read 800-486-7800. Also, the correct price for the kit in the headline is \$345.

In New & Improved (October 15, 1991), the phone numbers for Micro-Biz should have read 800-637-8268, 914-425-9500.

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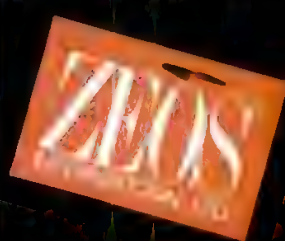
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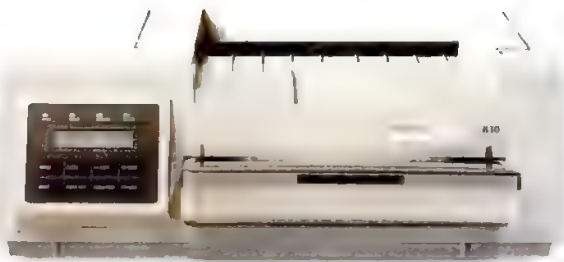
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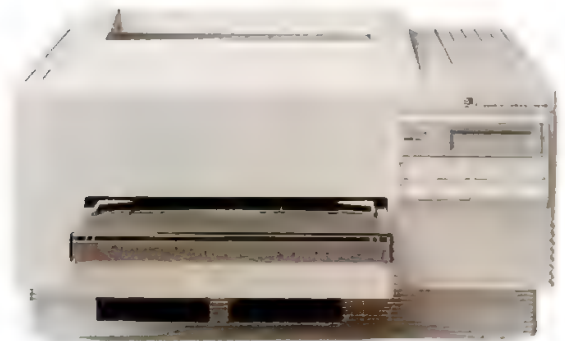
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- 1 meg is all you get, standard. Can't even remember one full page of graphics.
- No place to add a second tray. You're stuck with only one kind of paper at a time.
- Standard 1-year warranty. Not so smart.

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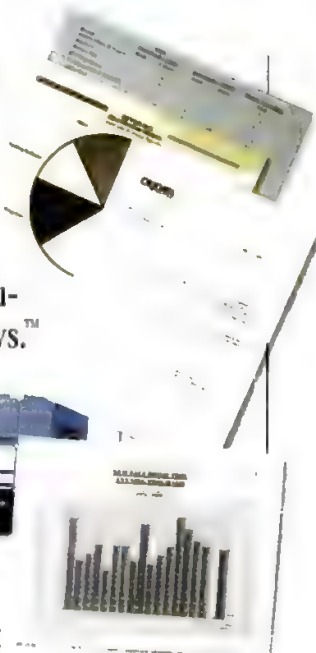
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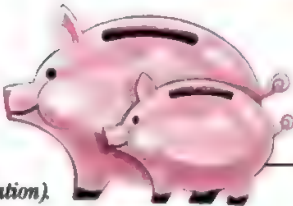
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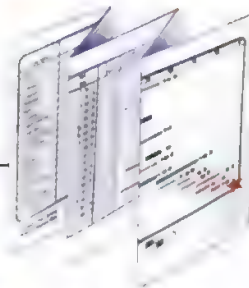
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by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

Apple and IBM Make It Legal, Outline Five-Point Plan for New Products in the Nineties

With many platitudes about computing in the nineties, IBM and Apple have made a very public show of their common interests. The only thing that's clear is that it will take years for this vision to become real.

The partnership is moving forward according to a five-point plan that will create two new companies, require the transfer of hundreds of employees now working for both companies, and encompass dozens of technology-sharing arrangements.

The first area likely to bear fruit is increased connectivity between Macs and IBM systems. Before the end of the year, AppleTalk will be running on IBM OS/2 servers. Down the road, Apple will incorporate Token-Ring into its own products and will make AS-400 terminal services available for Macs.

The second area of cooperation will be the creation of a RISC processor that is expected to be the foundation of a class of computers called PowerPC. Motorola and IBM engineers will create the new chip, basing it on IBM's RS/6000 design and keeping Mac compatibility as a final goal.

Apple says the new chip will be used in future Macs. IBM says it will use the new chip in workstations and servers. And Motorola says the other two will let it sell the chip to outsiders. This project will take two to three years.

The third goal is a Unix-based operating system for the RISC chip. Called PowerOpen, it will be an outgrowth of Apple A/UX

and IBM's AIX. The plan is to make it an open environment, available with the Mac interface, OSF/Motif, or any interface that a third-party wishes to put on top of it. PowerOpen should be ready about the same time the PowerPC platform is finished.

The fourth project involves a new company called Kaleida. Very few details were available about Kaleida, which is supposed to combine the Apple and IBM research into animation, video, and sound processing to develop new multimedia products. In keeping with the platform-independent spirit of the Apple/IBM plans, Kaleida plans to create new data formats for multimedia that will be system-independent.

Finally, the most ambitious project is the creation of an entirely new operating system built with object-oriented techniques. To ensure some measure of independence, a new company named Taligent was formed. This will be an outgrowth of the independent work that both companies have been doing. It includes Apple's work on the "Pink" environment and IBM's partnership with Metaphor (known as Patriot Partners).

Taligent's operating system should run on a wide range of processors, including the PowerPC, the Motorola 680x0 series, and the Intel 808x6 series.

The first goal is simple enough. It's a plan to take some of the market for connectivity away from smaller companies.

The Power PC and PowerOpen alliance is a direct response

to the Advanced Computing Environment initiative, and it builds nicely on both companies' current plans for increasing Unix support.

So the first three initiatives are merely good business for two companies that find that their former partners have become competitors. But the last two projects—Kaleida and Taligent—not only raise enormous numbers of questions, they seem to undermine a number of projects both companies are currently pressing.

Among the questions: Why does Kaleida need to develop new data formats when there's a wealth of ideas and standards that are already circulating and undersupported? Where's the

Clock Doubling Will Be The Next Way to Boost Processor Speed

When the first 486SX PCs began to ship, a curious socket appeared next to the processor. It looked like the home for a twin to the 486SX, and initially Intel said it was for the 487SX, a chip that added math coprocessing capability.

Now Intel has revealed a second role for the socket: a clock-doubling version of the 486SX. When these chips become available in 1992, you will be able to effectively double the performance of a 16-MHz 486SX to 33 MHz; the 20-MHz 486SX will be doubled to 40 MHz.



IBM & APPLE'S FIVE-POINT PLAN

- Better Mac-to-IBM connectivity
- PowerOpen, based on Unix
- PowerPC, based on IBM's RS/600
- Kaleida, a multimedia company
- Taligent, an operating-system company

evidence that Kaleida will support the new multimedia entries from IBM, such as the Ultima Media M57 SLC reviewed in this issue? And what about IBM's repeated endorsement of Intel's DVI (Digital Video Interactive)?

Why would anyone buy OS/2, a system that requires a long-term commitment, when Taligent's building an alternative that sounds a lot better and makes only the most passing effort at compatibility?

As of this writing, OS/2 2.0 is scheduled for shipment in the first quarter of 1992, around the same time that Microsoft will ship Windows 3.1.

And in the future, Intel plans to make upgrade sockets available for 486DX processors, so that 25s can become 50s and 33s can become 66s.

The new Intel chips will have a design that is roughly similar to the 486SX or DX but will include logic that doubles the incoming timing and then halves the outgoing processes.

While it might seem that this extra capacity would saturate the bus, Intel says that typical EISA and ISA machines have plenty of bandwidth for the extra data that the faster processors will generate.

CONTINUES ON PAGE 30

Pipeline

CONTINUED FROM PAGE 29

The Search for Video Speed Turns to Local-Bus Designs

In a recent issue, a First Looks review of the NEC PowerMate SX/20i appeared (November 12, 1991). It was an ordinary 20-MHz 386SX in all ways except one; it could be the harbinger of the best technique yet for accelerating video performance, especially in graphical environments.

The technique is known as "local bus," which lets the video access the processor at the speed of the processor, rather than at the 8-MHz rate of the ISA bus.

The NEC PowerMate SX/20i showed a fairly modest performance gain over comparable systems, but it didn't make full use of the local bus because the VGA controller was not specifically designed for a local-bus implementation. Thus, it wasn't pumping out the extra video signals that can be handled by a local-bus design. Two of the leading video logic designers, Headlands and S3, have begun to ship samples of Super VGA controllers that integrate a local bus with graphic accelerators.

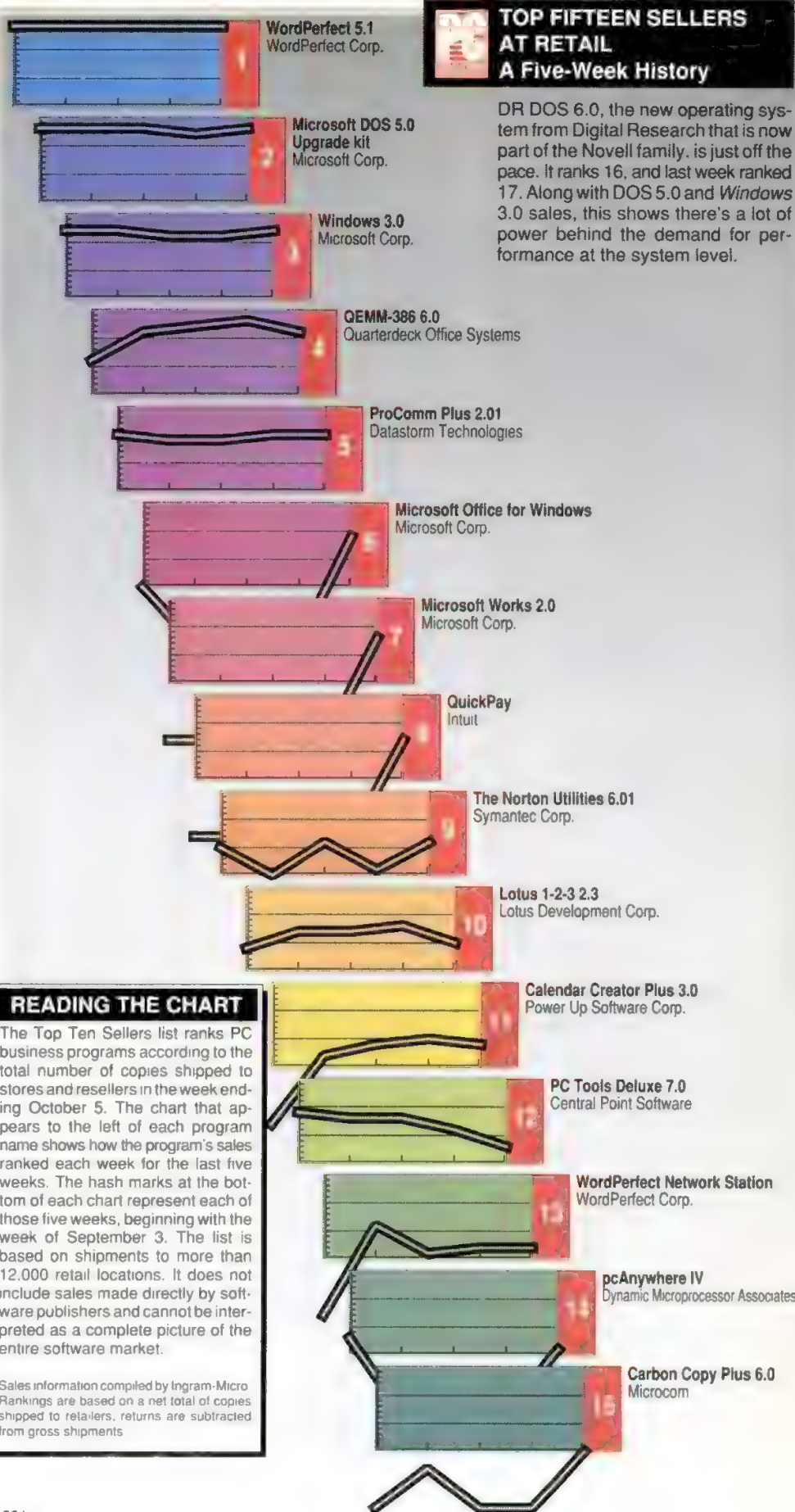
The local-bus VGA can be built directly onto a system board or sold as an add-in card. Announcements of local-bus Super VGA boards should become common from Super VGA vendors in coming months.

Toshiba at Work on Lithium Battery

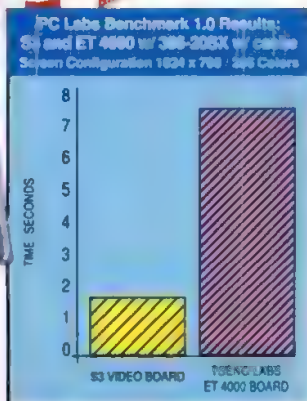
Toshiba, which took the lead in bringing nickel hydride batteries to laptops, believes it is within a year of perfecting a rechargeable lithium ion battery.

While nickel cadmium is the most common type of battery in laptops, concerns have been raised about its impact on the environment.

Lithium was first seen in NEC's Ultralite. It can deliver double the power of a nickel cadmium, but it has never been produced in sufficient quantities to make its use practical. ■



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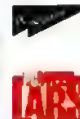
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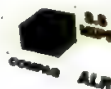
Both of these systems offer sleek, space-saving, styling, but the ALR BusinessSTATION 486ASX

The BusinessSTATION packs an array of other high performance features in its small-footprint box. Features like Built-in Super VGA. This design saves a valuable expansion slot, while offering eye-saving resolutions of up to 800x600 (1024x768 with an optional enhanced graphics package), and up to 25% greater performance than standard VGA cards.

i486SX, i486DX/33 & i486DX/50

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Memory Cache	8-KB	4-KB
Standard Bus	32-bit EISA	16-bit ISA
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Expansion Slots	5	4
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Starting Price	\$1,995	\$2,095

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First Looks

Hands-on Reviews of the Latest Products

Is Multimedia Real?

COVER STORY
by Robin Rackin

Computer and software vendors have been struggling to add multimedia features—graphics, sound, animation, and CD-ROM drives—to personal computers. But for a long time multimedia has been more promise than reality, in part because we had no standards for this technology.

The simultaneous introduction of the Microsoft-endorsed Multimedia PC and IBM's Ultimedia strategy have finally brought consistent standards to this market.

The Multimedia PC (MPC) standard is based on a minimum specification for CD-ROM performance, sound capabilities, and display graphics, and is designed to run applications written for *Microsoft Windows* with Multimedia Extensions. So far 11 hardware vendors have endorsed this specification for products such as Tandy's Multimedia 4033 LX, which is reviewed below.

To date, we've been able to preview a dozen of the more than 60 software titles announced for the MPC. These applications cover an amazing range of subject matter; how-

ever, the performance of MPC hardware and software often leaves much to be desired.

IBM's Ultimedia goes beyond the MPC specification with XGA graphics, a new enhanced version of the 386SL processor, and a higher-end CD-ROM. While there is nothing in this hardware that would prohibit it from running MPC software, IBM is not positioning the Ultimedia machine as MPC compatible. Instead, IBM is endorsing OS/2 2.0 as its multimedia environment. However, we have yet to see any OS/2 2.0 multimedia applications.

We are devoting the major

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REVIEW INDEX

IconAuthor:

A visual multimedia authoring tool 48

HP LaserJet IIP plus:

Faster personal printing..... 49

WinFax PRO:

Painless, handsome faxing 58

portion of this issue's First Looks section to looking at multimedia technology. It may not yet be a part of mainstream computing, but there's no turning back now.

IBM Chooses Different Course with its Ultimedia PC

PREVIEW
by Matthew J. Ross

The IBM PS/2 Ultimedia Model M57 SLC is a mix of excellent components whose sum may be less than the individual parts. The machine has an enhanced 386SX processor, 16-bit audio from a new version of IBM's M-Audio Capture and Playback Adapter/A (ACPA/A), IBM's CD-ROM II with CD-ROM/XA (extended architecture), Digital Video Interactive (DVI) support, and an advanced internal speaker that eliminates the need for separate speakers. These features are added to

the existing XGA graphics, built-in SCSI controller, and high-capacity 2.88MB floppy disk drive found in IBM's PS/2 Model 57 (see the review "IBM Strengthens Middle of PS/2 Line," First Looks, September 10, 1991).

Together, all these parts create an excellently engineered multimedia PC. But IBM may

CONTINUES ON PAGE 37



Tandy 4033 LX Multimedia: First MPC Incarnation Underwhelms

HANDS ON
by Matthew J. Ross

As one of the driving forces on the MPC Council, it's no surprise that Tandy is first out of the chute with a multimedia PC. Turning on the switch of the new Tandy 4033 LX Multimedia reveals no sign of DeskMate, the operating environment that has gone hand in hand with Tandy home machines in the past. Instead, what comes up is the enhanced version of *Microsoft Windows*, complete with Microsoft's Multimedia

Extensions.

Compared to previous Tandy/Radio Shack home systems, the 4033 LX is impressive, although costly. No CGA graphics or underpowered system here: The \$5,499 4033 LX Multimedia comes complete with a 33-MHz 386 processor,

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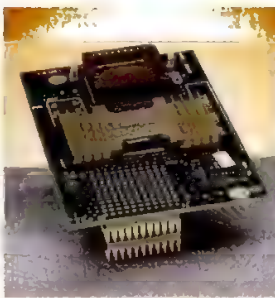
IBM'S CACHED SLC PROCESSOR POWERS ULTIMEDIA MODEL M57

by Matt Ross

At the heart of IBM's new PS/2 Ultimedia Model M57 SLC is a processor that deserves attention, and lots of it. Called the

IBM 386 SLC, this IBM-made part starts with Intel 80386SX/SL technology and goes on from there.

The 386 SLC combines a 20-MHz 386SX with an on-chip 8K internal cache. The SLC is implemented as an upgrade option for PS/2



mize coordination between cache and CPU.

One such optimization scheme is the SLC's intelligent write-back buffer organization.

With the CPU fully cache-aware, writing to memory is highly efficient. Instructions to write data to the cache and system memory are buffered, so that writes are executed when the data bus is free. Writes can be combined to improve perfor-

BENCHMARK TESTS: IBM PS/2 ULTIMEDIA MODEL M57 SLC

Performance Times

(Times given in seconds)

Lower scores represent better performance.

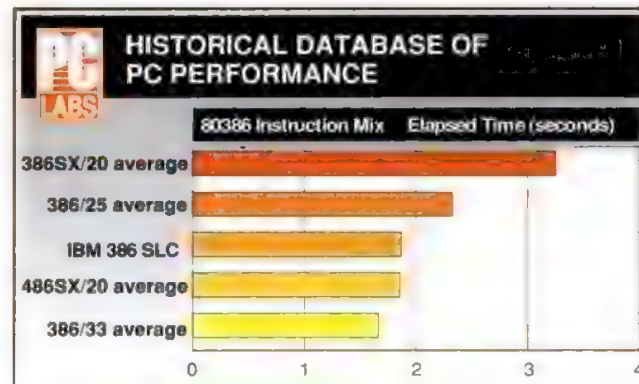
	80386 Instruction Mix	Conventional Memory
IBM PS/2 Model 57SX	3.54	0.66
Compaq Deskpro 386e/20	3.11	0.47
IBM PS/2 Ultimedia Model M57 SLC	1.87	0.33

IBM has effectively doubled the performance of a 386SX 20-MHz processor with the new 386 SLC part in the Ultimedia. Its performance rivals that of a 33-MHz 386DX and a 20-MHz 486SX.

Model 57s and resides on a small daughtercard (the Cached Processor Option). It plugs into the 80387SX coprocessor slot and disables the motherboard's CPU. The daughtercard has a slot for a 387SX, so you can still install a math chip.

With the 386 SLC, IBM did not stop at a functional, pin-for-pin equivalent version of an Intel processor but added an on-chip 8K, two-way set associative cache. Unlike Intel's 386SX and DX lines, which may or may not work with a processor RAM cache when integrated into a PC, IBM's engineers optimized the SLC to maxi-

mance, and the number of writes is reduced by the close coordination between CPU and cache. Enhanced branch performance stops the CPU's prefetch operations and frees up DMA channels.



PERFORMANCE TESTS: MULTIMEDIA PC CD-ROM DRIVES

Tandy's ponderous performance on random access tests will make MPC software painfully slow. Tandy cannot deliver enough throughput to effectively run CD-ROM-based software, particularly where video and audio need to be synced. IBM's throughput performance is far superior. MPC is a moot point for IBM, however, due to its failure to provide a device driver that allows its CD-ROM XA drive to communicate with *Multimedia Windows*.

■ The Sequential Throughput is calculated by measuring the average time required to read 1.6MB of contiguous binary data in block

sizes of approximately 64K; sequential throughput reflects the drive's performance during such operations as loading programs and large data files. (Please note that our sequential throughput measurement is not quite the same as the sustained transfer rate that defines suitability for running digitized video under the MPC specification.)

■ The Random Throughput is calculated by measuring the average time required to perform non-contiguous reads of 1.6MB of ASCII data in block sizes of approximately 64K; this reflects the drive's performance when searching through databases and jumping from one hypertextual link to another. The results for an ASCII file, reported here, reflect the worst performance but the most common file type for this operation.

Throughput
(kilobytes per second)

Sequential
Access

Random
Access

IBM PS/2 Ultimedia M57 SLC	151.31	111.54
Sony CDU-7205	149.45	113.99
Tandy 4033 LX Multimedia	146.56	69.98

Higher scores represent better performance.

*The Sony CDU-7205 is an external drive tested with a Compaq Deskpro 386/25e with 8MB RAM and Compaq DOS 4.01. It is reported here for comparison purposes.

IBM has optimized the most-used CPU instructions to be executed faster than the system's 20-MHz clock. Here the cache is exploited, and instructions that involve additional cycles as the CPU waits for data are performed on the fly, since the cache has delivered the data before the CPU has to request it.

So what's the bottom line? IBM's part provides almost double the performance of a typical 20-MHz

386SX. A look at the historical database of all systems tested in PC Labs reveals that the 386 SLC performs comparatively with a 20-MHz 486SX and is just slightly slower than a 33-MHz 386DX. The benchmark test indicates that in addition to speeding the execution of instructions, IBM's SLC effectively doubles memory performance.

The 386 SLC uses a static design with power management features found in Intel's 386SL chip. Power can be turned off, but the SLC will be able to preserve and resume its current state. According to IBM, these functions work, but have not been incorporated into this desktop implementation of the 386 SLC.

List Price: IBM 386 SLC Processor Option, \$780.

CIRCLE 700 ON READER SERVICE CARD

First Looks

IBM Ultimedia

CONTINUED FROM PAGE 35

be letting operating system politics get in the way of its technical prowess.

IBM sees its OS/2 2.0 with its Multimedia Presentation Manager as the superior multimedia environment because OS/2 has 32-bit multithreaded capabilities and the ability to bus-master devices. In fact, IBM makes you first boot the Ultimedia PC under OS/2. Only then can you switch to DOS 5.0 and Multimedia Windows, both of which you install from a CD.

Right now, this OS/2 2.0-based vision is more of a promise than it is a reality, at least until OS/2, Version 2.0 ships next March. The success of the Ultimedia becomes a question of how robust OS/2 2.0 will be, since IBM expects the majority of its users to work under its own operating system—running Windows and DOS apps from OS/2. Ironically, IBM is hedging its bets, shipping its Ultimedia with Windows and the Multimedia Extensions. However, many vendors have pledged their support to IBM's OS/2 multimedia vision, and OS/2 multimedia titles may start appearing soon.

While the Ultimedia has everything necessary for MPC certification (with the exception of MIDI-in), IBM will not guarantee that MPC-approved software will run on its system. In addition, IBM does not endorse the MPC (multimedia PC) specification and views the MPC spec as a mark set too low for serious multimedia computing.

The preview Ultimedia that IBM sent *PC Magazine* is a far more capable multimedia machine from a hardware perspective than the Tandy 4033 LX, but it was far from complete. The unit shipped with OS/2 2.0, DOS 5.0, and Multimedia Windows on a CD-ROM, supposedly for simple installation. For us, however, installation was not so smooth, requiring several attempts. In addition, the Ulti-

THE MULTIMEDIA PLATFORM: VARIATIONS ON A THEME			
	IBM PS/2 Ultimedia Model M57 SLC	MPC Minimum Specification	Tandy 4033LX Multimedia
CPU	20-MHz 386SLC	10-MHz 286	33-MHz 386
System memory	4MB	2MB	4MB
Storage	80MB SCSI hard disk, 2.88MB floppy disk drive	30MB hard disk, 1.44MB floppy disk drive	105MB IDE hard disk, 1.44MB floppy disk drive
Video display	XGA	VGA	Super VGA
Audio	16-bit sampling, MIDI-out, 16-bit ADPCM compression and decompression, CD-ROM XA	8-bit sampling, music synthesizer, MIDI-in/ MIDI-out, on-board analog audio mixing	8-bit sampling, music synthesizer, MIDI-in/ MIDI-out, on-board analog audio mixing
Optical storage	CD-ROM with CD-ROM XA (DVI-compatible)	CD-ROM with CD-Digital Audio (Red Book) output	CD-ROM with CD-Digital Audio (Red Book) output
Software	DOS 5.0, Microsoft Windows 3.0 with Multimedia Extensions, OS/2 2.0	DOS 5.0, Microsoft Windows 3.0 with Multimedia Extensions	DOS 5.0, Microsoft Windows 3.0 with Multimedia Extensions

media lacked the enhanced processor, IBM's 386 SLC, as well as the most current CD-ROM driver, MSCDEX.EXE, Version 2.2. And like Tandy, IBM ships its system with a hard disk that is too small (80MB) for serious multimedia computing. Fortunately, another drive bay is available and IBM's built-in SCSI controller makes expansion simple.

With its lack of an appropriate CD-ROM driver and IBM's refusal to endorse the MPC specification, compatibility is a real concern. We were unable to play the MPC software titles

available at the time of this review. *Multimedia Beethoven*, for instance, would not run on the system; we had to settle for playing the digital audio portion of the disk only.

The sound generated from IBM's enhanced internal speaker and audio card, however, is wonderful and is enough to fill a large room for a presentation. The speed and color of IBM's XGA graphics is commendable, and the seek and throughput performance of its CD-ROM/XA is top-notch. The performance will be even faster with IBM's 386 SLC CPU pre-

sent.

IBM sees the Ultimedia as a serious business machine and authoring tool for multimedia presentations, particularly under OS/2. We hope that IBM won't cut itself off completely from an industry intent on following Microsoft's lead, because the Ultimedia has the potential to be the measure by which other multimedia PCs are judged.

List Price: IBM PS/2 Ultimedia Model M57 SLC, \$5,995. IBM Corp., Old Orchard Rd., Armonk, NY 10605; 800-426-2468.

CIRCLE 708 ON READER SERVICE CARD

Tandy

CONTINUED FROM PAGE 35

4MB RAM, a 105MB IDE hard disk, a 3.5-inch floppy disk drive, Super VGA, Windows 3.0 with the Multimedia Extensions, and DOS 5.0. The 4033 LX machine is the top of Tandy's line of multimedia PCs, which starts with a 16-MHz 386SX for \$2,799 and also features a 20-MHz SX system as well as 16- and 25-MHz 386DX systems.

Rounding out the multimedia package offered by the 4033 LX is Tandy's own internal

CDR-1000 CD-ROM drive and the Sound Blaster Pro audio card developed by Creative Labs. Tandy also includes a CD-ROM-based welcoming tour of the system's multimedia capabilities.

The tour is the first place where your patience is tried. To any experienced PC user, waiting for Windows to do its thing is nothing new. But trying to run CD-ROM-based MPC software on the Tandy is an experience that would try the patience of Job.

The heart of the problem is Tandy's CDR-1000 ROM

drive. While Tandy claims that its ROM drive, with its rated access time of 1 second, delivers a continuous data transfer rate of 150 kilobytes per second, tests in PC Labs tell a different story. Inside the 4033 LX, Tandy's CD-ROM drive delivers a throughput of 146.96 kilobytes per second on sequential reads from a compact disk (such as when copying files in an installation procedure), but delivers a throughput of under 70 KBps in random reads (the normal access to a ROM drive when running CD-ROM-based soft-

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First Looks

Tandy

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ware). (See "Performance Tests: Multimedia PC CD-ROM Drives." Volume 10, Issue 18).

This poor performance manifests itself when running MPC ROM-based software.

Even with a 33-MHz 386 processor, the 4033 LX does not synchronize motion video or animation effectively with audio. Animations are herky-jerky, the audio is inconsistent, and the *Windows* hourglass is

seemingly everpresent. Software design may be in part responsible, since CD-ROM developers are still learning how to minimize nonsequential data access.

The design of the CDR-1000 drive also demands attention. To its credit, and unlike just about every other ROM drive on the market, Tandy's drive requires no CD carrier to hold disks. By pushing in on the drive, you mechanically release the unit from its bay; it extends far enough outward to place a disk directly in the drive. However this design proves to be less stable, increasing the chances that CDs will skip peri-

odically.

Once, I accidentally skipped an audio disk while I was trying to plug headphones into the jack located on the drive's front panel. A second time, also while plugging in headphones, I inadvertently opened the drive bay while a disk was spinning.

The Tandy 4033 LX Multimedia also suffers from limited expansion options, since most of its slots are filled with video, audio, and CD-ROM interface boards. And the machine's 105MB hard disk is too small for a top-of-the-line multimedia PC; Tandy should offer a larger capacity drive.

Nevertheless, Tandy has de-

livered a system that is easy to put together. The software is preinstalled; the CD-ROM drive and the Sound Blaster Pro are ready to go. You have a working system simply by plugging a pair of speakers into the sound board.

The 4033 LX demonstrates the potential for multimedia computing. If Tandy improves the performance of its CD-ROM drive, this potential will become reality.

List Price: Tandy 4033 LX Multimedia, \$5,499. Tandy Corp., 700 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.

CIRCLE 705 ON READER SERVICE CARD

MPC SEAL BRINGS THAT WARM, FUZZY FEELING TO MULTIMEDIA

by Christopher Barr
and Mary K. Flynn

What does it mean to have an MPC logo on a hardware or software product? Not as much as you might think. It doesn't mean that the product has been tested by the Multimedia PC Marketing Council, the umbrella organization responsible for promoting Microsoft's multimedia computing specification. Nor does it offer the consumer any guarantee of satisfaction.

The MPC logo is a trademark, not a certification. What the MPC logo does provide is that warm, fuzzy feeling of assurance that you are buying into a family of products—a family that shares Microsoft's vision of a multimedia standard.

Although logos that indicate plug-and-play compatibility may be new to PC users, they are quite common in the consumer electronics marketplace. For example, the "VHS" logo lets you know that the video tape you're taking home will work on any VCR that also carries the logo.

Logos like these may not mean much to sophisticated users well-versed in the jargon of multimedia. However, logos do make it easier

for less sophisticated users to identify which products to buy—as long as they remember that it's the vendors, and not an independent auditing agency, that guarantee product compatibility.

The MPC logo can be found on three types of products—PCs, up-

grade kits (see the sidebar "Multimedia Upgrade Kits"), and software packages (see the sidebar "An MPC Software Sampler"). PCs and upgrade kits must meet all of the Council's minimum specifications (see the chart on page 37).



Hardware products that have only one aspect of MPC—an audio board, for example—can be MPC-compatible but aren't allowed to use the logo because they don't provide complete MPC capability. For software, the MPC logo is less restrictive: It indicates that the software exploits at

least one aspect of multimedia and supports the multimedia extensions in *Microsoft Windows*. Companies that use the logo inappropriately run the risk of losing their MPC license.

The logo is licensed by the Multimedia PC Marketing Council, a trade organization made up of ten hardware vendors (AT&T Computer Systems, CompuAdd Corp., Creative Labs Inc., Media Vision, NEC Technologies, Olivetti, Philips

Consumer Electronics Co., Tandy Corp., Video Seven, and Zenith Data Systems) and one big software company, Microsoft. Each member company has a seat on the board of directors, as does the Software Publishers Association, of which the MPC Marketing Council is a subsidiary.

System manufacturers can become council members with full licensing privileges of the MPC trademark for a onetime fee of \$250,000. Upgrade kit manufacturers can also join the MPC council for \$100,000. (Optionally, manufacturers can license the MPC trade-

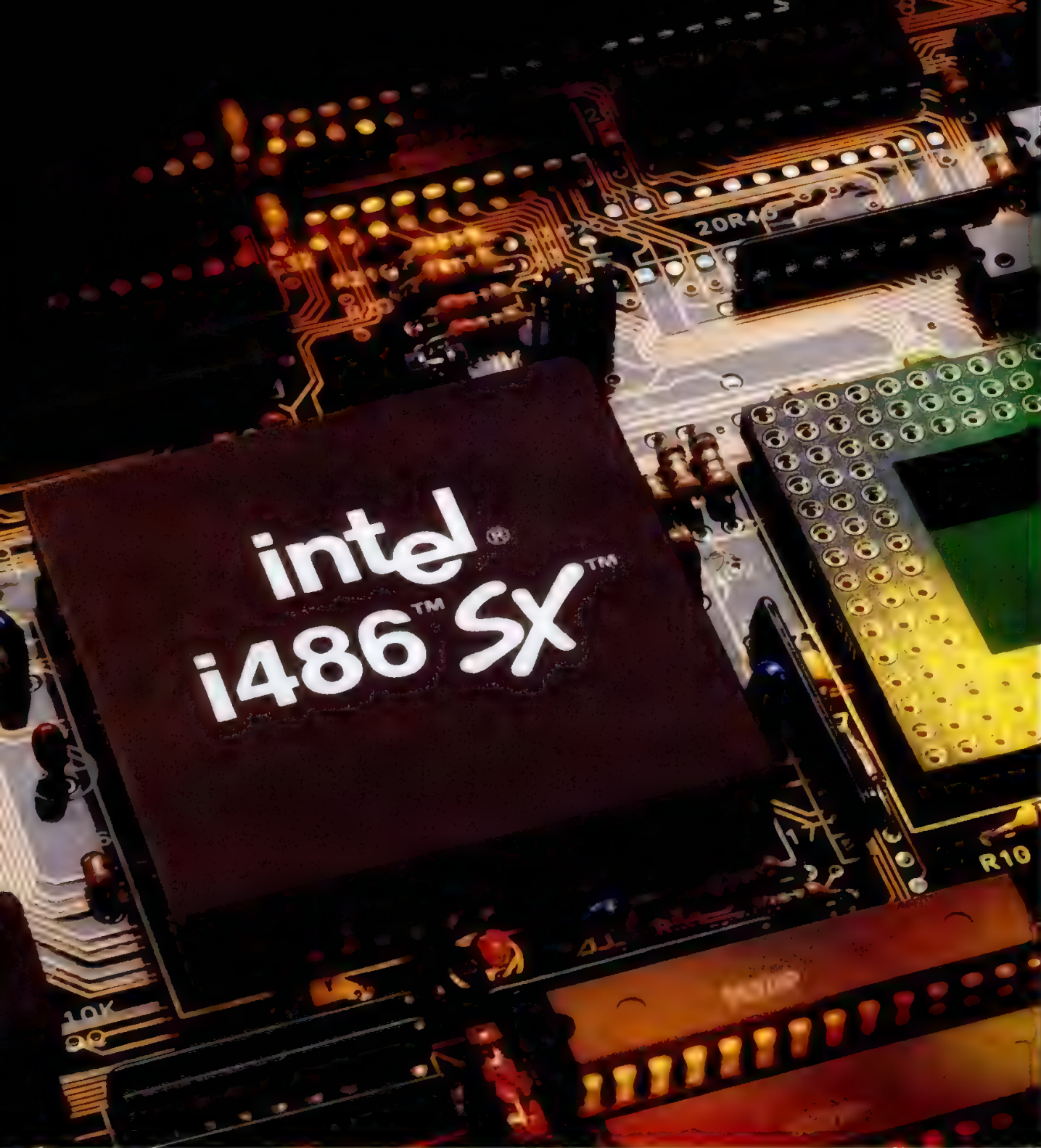
mark on a per system basis at a much lower fee.)

Independent software vendors can license the logo for \$500 per title. This lets them display the MPC trademark on their products, pledging that their software will run on the baseline hardware platform, that it is 100 percent compatible with *Microsoft Windows* Multimedia Extensions Version 1.0, and that their software uses at least one "multimedia" element of the *Windows* Multimedia Extensions: MIDI, waveform, CD audio, or animation.

As an evangelist for MPC multimedia, the Council sponsors events (such as the New York MPC product launch in October, which featured 40 software companies and 30 hardware companies), places ads, and distributes a titles catalog and a sampler disk with MPC-compatible applications. If the Council does its job, new buzzwords like MPC-compatible and MPC machines will become everyday industry words. Ultimately, you may be able to walk into your neighborhood software store and ask for the MPC section—right there between Languages and Networks.

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Room for the future. Intro



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Intel has developed an upgrade processor, due in 1992, that will plug into many 486 SX systems. With this simple addition, you'll double CPU performance. The net effect: an overall system performance boost of up to 70 percent—



roducing built-in upgradability.

across all applications. Plus, you'll get on-chip math capabilities.

So consult your dealer to see which 486SX systems are upgradable. Or call 1-800-722-7772 for a free, informative brochure.

And check into the computer with room for the future today.

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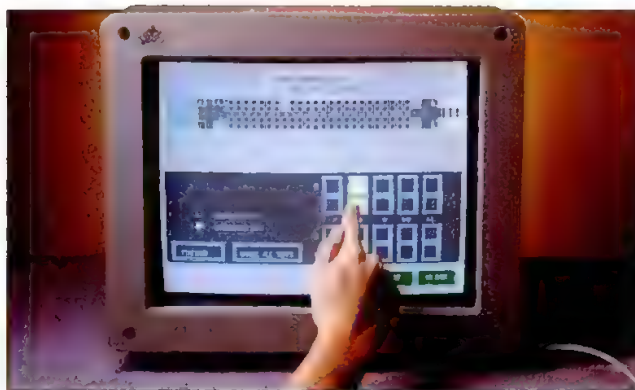
First Looks

TouchSelect Turns Ordinary Monitors into Touch-Screens

HANDS ON
by Nate Zelnick

IBM's PS/2 Touch Display 8516, (see First Looks, September 10, 1991, page 38) debuted a new three-dimensional touch-screen technology that didn't need screen overlays, special adapters, or hardware. That technology can now be added to IBM's 12-inch 8513 and 19-inch 7554 monitors using the PS/2 TouchSelect upgrade, priced at \$670 for the 8513 and \$850 for the 7554. IBM plans to include other monitors with future releases.

The unit uses four highly sensitive instruments called



Extensometers in the PS/2 TouchSelect measure surface tension and x and y coordinates.

strain gauges, or extensometers, to measure minute tensions and compression differences on a surface. Mounted on each corner of the screen, they measure the location and pressure of your point of contact.

This means that you can use just about anything, from your finger to a screwdriver, as a pointing stylus. Because it measures the tension on the surface,

as well as the 4,096 by 4,096 coordinates on the x- and y-axes, it accepts three-dimensional input.

The strain gauges and processor are housed in a flat, tempered glass panel. The device mounts to a hairline slot on the front of the 8513, and it bolts onto the more industrial strength, 19-inch Model 7554.

A cord connects the device

to a PS/2 mouse port, from which both power and data are drawn. An additional mouse port lets you use the mouse and touch-screen interchangeably. The screen uses a relative positioning algorithm which allows it to track movement within ranges and to accelerate cursor movement based on the speed of your movement. Unfortunately, if you hit the screen in two places at once, it picks an average position, which makes it impractical for drag and drop.

Applications development for the TouchSelect system can be done using *AVC (Audio Visual Connection)*, *LinkWay*, *InfoWindow*, and *M-Control Program/2* authoring systems. Device drivers for DOS, Windows, and OS/2 are available. ■

List Price: IBM TouchSelect, for 8513 \$670; for 7554, \$850.
Requires: IBM Model 8513 or Model 7554 monitor. IBM Corp., Old Orchard Rd., Armonk, NY 10605; 800-426-2468.

CIRCLE 704 ON READER SERVICE CARD

IBM Poised for TV-in-a-Window and Video E-Mail

HANDS ON
by Nate Zelnick

IBM's PS/2 TV is a television tuner that allows an ordinary VGA monitor to display NTSC-standard video. The \$495 device lets you put TV-in-a-window on your computer—either as a full screen or as a PIP (picture in picture). The latter displays a video image in one-ninth of the PC's screen. It can be moved anywhere on the screen, but it cannot be resized.

In PIP mode, the PS/2 TV creates a video overlay by cutting a "hole" in the VGA image and inserting the video image. When you move the image, the on-board processor quickly calculates the new space, makes cuts, and continues the broadcast.

Press NumLock twice and the unit, which sits under your monitor, turns the keyboard into your TV controller. Then move through the on-screen menu system to control brightness, contrast, volume, and display mode (either PIP or full screen).

Once your display options are set, you can release the keyboard and continue computing while your TV plays on. IBM bundles a pair of mini-apps that mimic a TV's remote control.

The PS/2 TV has both BNC and RCA-type connectors on the back. It can accept input from any analog device.

For now, the PS/2 TV is definitely a "Sharper Image" type item. It's easy to install; the im-

age is sharp and clear, but it doesn't do much of anything useful. IBM is counting on third-party support to whip up some practical applications. You'll probably see the TV-in-a-window inextricably linked to other Windows apps as a DLL.

IBM extends their analog video solution through an ingenious \$85 device called the F-Coupler. It uses the existing cabling of a 4MB or 16MB To-

ken-Ring network to send analog information across the digital network. The possibility for using this technology to broadcast analog video signals across the existing digital office network is exciting.

The F-Coupler capitalizes on the cable's 500 MHz of free bandwidth, using the area between 50 and 550 MHz for audio and video data, and the area below 50 MHz for digital data.

Installation requires replacing the standard Token-Ring faceplate to accommodate the F-Coupler's coaxial connector. This connector happens to fit the BNC port on the PS/2 TV. The PS/2 TV and F-Coupler form a clever solution for pass-through video. What's more, neither one requires IBM equipment. The PS/2-TV works with any VGA monitor; the F-Coupler works on any Token-Ring network. ■

List Price: IBM PS/2 TV, \$495; IBM Corporation, Old Orchard Rd., Armonk, NY 10605; 800-426-2468.

CIRCLE 703 ON READER SERVICE CARD



Our Latest PostScript Printer Technology Impressed The Experts...

QMS-PS 410
Now Only
\$2,395



MacUser,
Editor's Choice Award
(Eddy), Jan. 9, 1991



PC/Computing,
Most Valuable
Product,
Nov. 1990



BYTE,
Editor's Product
Merit Award,
Jan. 1991



Personal Publishing,
1990 Outstanding
Achievement Award

POSTSCRIPT

...So We Decided To Give Them More Of A Good Thing.

Before we developed the QMS-PS® 410 four page-per-minute laser printer, we performed one very important task. We listened to what you wanted. Then we engineered a printer light years ahead of the rest with features that aren't available on other printers at any price.

And now, QMS brings you more of a good thing. The QMS-PS 815 and 825. Two eight page-per-minute laser printers with all the leading edge features of the 410 *plus* enhanced processing speed, an increased duty cycle and an easy-to-read, multilingual front panel that lets you quickly configure the printer to suit your specific needs.

Award-Winning Simplicity

How did these printers capture the imagination of an entire industry? The answer is, quite literally, simple! These leading edge printers are so simple to operate they seem to "think for you." Each printer features ESP® (Emulation Sensing Processor) which allows them to interpret incoming data and automatically choose the appropriate printer language without changing switch settings or sending complicated software commands. And to make things still simpler, the 410, 815

and 825 can receive data simultaneously to LocalTalk®, RS-232C serial and Centronics® parallel interfaces, which makes them the best on the market for mixed computer environments. All this and more is the result of QMS's exclusive ASAP™ III technology (Third Generation Advanced System Architecture for Printing). And it's this proprietary QMS® technology that wins awards *and* customers.

True Adobe PostScript Plus HP Emulations

Whether you choose the 410, 815 or 825, you'll enjoy the desktop design flexibility of the latest version of Adobe® PostScript®. This most recent version includes the output enhancement of Adobe Type Manager™ (ATM). All printers come standard with 45 resident typefaces scalable from 4 points upward and fully rotatable. These PostScript printers guarantee compatibility with thousands of useful PostScript applications currently on the market.

For even greater flexibility, these printers feature standard HP® LaserJet® Series IIP emulation to support non-PostScript printing applications. And a variety of options makes the printers easily expandable. HP-GL®

QMS-PS 410, 815 & 825 PostScript Laser Printers

- ESP - Emulation Sensing Processor (printer interprets incoming printer language and switches automatically)
- SIO-Simultaneous Interface Operation (allows the printer to receive data from three interfaces simultaneously)
- LocalTalk, RS-232C serial and Centronics parallel interfaces (connects to IBM® PC's, Apple® Macintosh® computers and most mini computers and mainframes)
- 45 resident Adobe PostScript typefaces (all can be scaled from 4 points upward, rotatable, all with multilingual character sets)
- Front Panel Display on QMS-PS 815 & 825 (16-digit multilingual LCD array conveys printer status, allows user to quickly configure printer)
- Resident HP LaserJet Series IIP & PostScript emulations (prints PostScript & HP applications, HP-GL emulation cards available)
- QMS ASAP III Technology and 68020 Microprocessor (exclusive technology means fast first-page-out performance)
- PS Executive Series™ Utilities Software (to easily set printer parameters)

emulation cards, HP compatible font cards, memory upgrades and extended paper handling capabilities are all currently available.

Expert Service And Support

As a recognized leader in PostScript printer technology, QMS maintains a commitment to customer satisfaction by providing free, responsive technical support. And to keep your QMS printer operating at its peak, QMS National Service offers a variety of service options. Call us today and see how QMS quite simply makes the best PostScript laser printers in the world. Or FAX QMS Product Information at (205) 633-4866.

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*patent pending

MULTIMEDIA UPGRADE KITS

by Tin Albano

You don't have to buy a new Multimedia PC to be MPC compliant. Here are six ways to upgrade your PC compatible computer to meet MPC standards.

CompuAdd Co.: CompuAdd's Multimedia Upgrade Kit comes bundled with CompuAdd's Multimedia upgrade audio board, a Sony CD-ROM drive, *Microsoft Windows 3.0* with Multimedia Extensions 1.0 and CompuAdd's *Rack Manager*. The upgrade kit is \$1,069 with an internal CD-ROM drive, \$1,295 with an external drive. CompuAdd also offers a TV/Video Board that integrates audio and full-motion digitized video with the PC for \$525, and a AM/FM Tuner Board with an infrared remote control for \$299. 12303 Technology Boulevard, Austin, TX 78727; 512-250-1489.

Creative Labs Inc.: Creative Labs' Creative Multimedia Upgrade Kit comes with the company's own SoundBlaster Pro audio card, a Matsushita Panasonic CD-ROM drive, and the following software: *Microsoft Windows 3.0* with Multimedia Extensions 1.0, *Microsoft Bookshelf*, Prosonus and Creative Labs' CD-ROM, titled *Creative Sounds*, Selectware Co.'s *Selectware System*, and Sierra On-Line's video game, *Jones in the Fast Lane*. Creative Labs also added 200 music titles to the *Windows CD*. The upgrade kit is \$849.95 with an internal CD-ROM drive; \$949.95 with an external drive. 2050 Duane Ave., Santa Clara, CA 95054; 408-986-1461.

Media Vision Inc.: Media Vision's MPC Upgrade Kit, \$995, comes with the company's Pro Audio Spectrum

sound board, an internal Sony CD-ROM drive, *Microsoft Windows 3.0* with Multimedia Extensions 1.0, *Compton's Multimedia Encyclopedia*, and Sierra On-Line's *Jones in the Fast Lane*. 47221 Fremont Blvd., Fremont, CA 94538; 800-348-7116, 415-770-8600.

Tandy Corp.: The Tandy Multimedia PC upgrade kit includes a Tandy 16-bit audio board, a Tandy CDR-1000 CD-ROM drive, and *Microsoft Windows 3.0* with Multimedia Extensions 1.0. An upgrade kit with an internal CD-ROM drive will sell for \$799.95; \$899.95 with an external drive. 1800 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.

Video Seven: Video Seven's Multimedia Upgrade Kit has *Microsoft Windows 3.0* with Multimedia Extensions 1.0 and Texel Ameri-

ca's CD-ROM drive. The kit costs \$749 with an internal CD-ROM drive; \$899 with an external drive. Video Seven also has an add-on card, the \$349 Media FX, which will upgrade audio capabilities to full digital stereo sound. 46221 Landing Parkway, Fremont, CA 94538; 510-623-7857.

Dolch: For those who own Dolch portable computers, Dolch offers the Multimedia P.A.C. upgrade kit, \$3,995, which enables its entire line of computers to meet MPC standards. The kit includes Creative Labs' SoundBlaster Pro audio card, Dolch's PC Video card (which uses a chip set from Chips and Technologies), a Sony CD-ROM drive, and *Microsoft Windows 3.0* with Multimedia Extensions 1.0. 372 Turquoise St., Milpitas, CA 95035; 800-538-7506, 408-957-6575.

MULTIMEDIA VIDEO: A Primer

by Nate Zelnick

There are three basic ways to bring motion video to PCs:

- analog pass-through, which includes the laserdisk and VCR;
- software-based video, now part of *Windows Multimedia Extensions*;
- hardware-assisted video, which is used in Intel and IBM's DVI (Digital Video Interactive), as well as in JPEG and MPEG compression schemes.

Analog systems offer good image quality, since images don't suffer any degradation during conversion to digital formats. But a digital computer is limited to displaying, not manipulating the analog image.

Microsoft is promoting a new software-based video technique. Its RIFF (Resource Interchange File Format) standard, also agreed upon by IBM, lets you interleave video and audio information so it's pulled from the disk in a sequential datastream. Today this includes sound, animation, and text, but as an extensible format will also accommodate compression. Microsoft's AVI (Audio Visual Interleaved) is a RIFF file that contains interleaved audio and video chunks combined with standard RLE compression, to achieve on-screen animation at 15 frames per second. This isn't too bad in a small video window, but in

a larger window, images are grainy and out of sync. A talking person looks like Max Headroom.

Hardware-assisted compression schemes help increase the video throughput speed and reduce the size of huge digital video frames. IBM's ActionMedia system combines both DVI and JPEG support to this end. At the heart of the system is Intel's i750 chip—a dedicated video processor that can handle compression, decompression, manipulation, and playback.

To make DVI affordable, IBM and Intel split the pro-



cess into authoring and playback tools. To produce presentation level video (PLV), software must be produced at off-site studios for \$250 per minute of video. IBM's ActionMedia II (\$1,995) for the desktop can play back PLV, but can only record real-time video (RTV), which is acceptable in a one-fourth window frame but grainy at full frame.

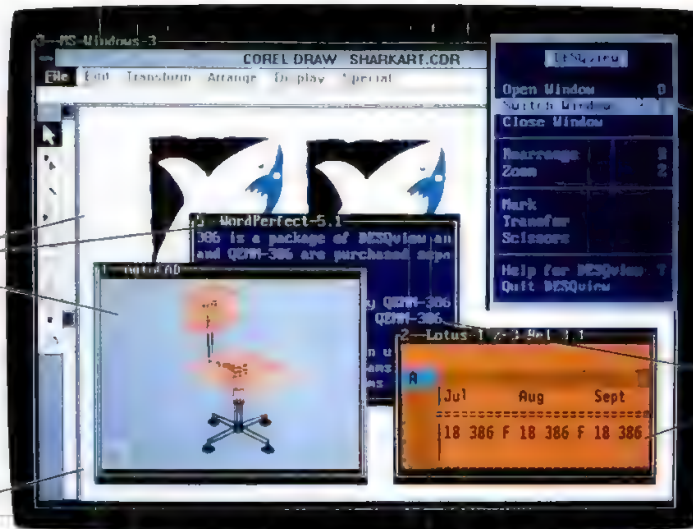
Better Windows

Solve memory problems
QEMM 386 makes the most of every last 'K'. DESQview uses that memory to run multiple programs.

Multitask
Run multiple programs side-by-side in windows. 'Background' programs can continue to run.

See text and graphics side-by-side
Reference information in your graphics program while writing your report.

Run Windows programs
DESQview even lets you run Microsoft Windows.



Easy menu access to programs and DOS services

Access programs or DOS in a window with just a few keystrokes or mouse clicks. It's that simple.

See multiple files
If your programs allow it, DESQview lets you run the same program in two or more windows. Great for comparing files.

Cut and paste data
Transfer data between programs with a few keystrokes.

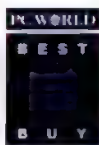
Handle large programs
Run standard DOS programs side-by-side with DOS-extended programs like 1-2-3 Release 1.

DESQview. The Multitasking, Windowing Environment.

Once the power user's secret, DESQview has been discovered by computer knowledgeable people everywhere. Over 1,000,000 people have bought DESQview.

Multitasking; windowing, using keyboard or mouse commands, it's all easy with DESQview.

DESQview 386 2.3 lets you use your favorite DOS and DOS-extended programs in windows side-by-side on 386SX, 80386 and i486 PCs. As you can see above, you can even run Microsoft Windows



within DESQview.

DESQview 2.3 gives 8088, 8086 and 286 PCs with additional memory most of the same capabilities with surprisingly little performance trade-off.

Whatever programs you use—DOS, extended DOS or Windows—and whatever hardware you have, whether 8088 or i486 or something in between, DESQview is still the best way to get the most out of the hardware and software you own today.

DESQview. When you look into it, it's the obvious choice.

Quarterdeck

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (213) 392-9851 Fax (213) 399-3802
CIRCLE 338 ON READER SERVICE CARD

WORKING, PLAYING, AND LEARNING: An MPC Software Sampler

by Carol Levin

In early October the Multimedia PC Marketing Council gathered hardware and software developers to roll out the MPC and a wave of software that blends photographic-quality images, digital audio sound, and animation. Each title comes on a CD-ROM with the MPC logo, which means the software is ready to run on any PC with the MPC logo or on any PC that has been upgraded with the proper audio, graphics adapter, and CD-ROM support. This identifies the software as meeting the *minimum* MPC software specification—use of audio or digitized video, support

WORKING

IconAuthor: A full-blown visual authoring system for nonprogrammers. Flowchart metaphor lets you combine text, graphics, full-motion video, animation, digital audio files, and external applications. Link elements to icons to create presentations. \$4,995, Aim-Tech Corp., 800-289-2884, 603-883-0220.

MediaSource: Series of ten CD-ROM libraries on topics from aerospace to medicine. Each library has 1,500 images and 90 minutes of music and sound effects. Search engine helps find the right material to integrate into multimedia presentations. License restricts use. \$395 each, Applied Optical Media Corp., 215-429-3701.

Multimedia Explorer: Select from a collection of animated clips, digitized audio, and MIDI clips. Produce 256-color 2-D

animations with the *Autodesk Animator* module. Synchronize sound and image with *Autodesk's Animation Player for Windows*, which lets you play back animations in real time. \$199, Autodesk Inc., 800-525-2763, 415-491-8304.

Multimedia ToolBook Integrated: A hypercardlike environment that provides a high-level construction kit for Windows applications. Supports CD-ROMs, laser-disk players, animation software, waveform audio cards, overlay video boards, and MIDI sequences. Copy and paste using 250 predefined multimedia "wid-

LEARNING

Compton's Multimedia Encyclopedia for Windows: Watch a spider spinning its web and a human heart pumping in this 26-volume encyclopedia for the family, enhanced with 45 animated sequences, 15,000 images, and 60 minutes of music and sound. Colorful interface makes cross-references and searches as easy as pie. Compton's New Media, \$895, 800-533-0130.

Great Cities of the World: For business and armchair travelers. Visit ten cities from Cairo to Tokyo through high-quality slide shows, tours of local history, culture, and restaurants. Real voice teaches useful phrases in native languages. \$129, InterOptica, 011-852-824-2868 (Hong Kong).

Learn to Speak Spanish: Teach yourself Spanish in 30 lessons. Digitized voices of native speakers help you pick up conversation skills. Record and play back your own voice to work on accent. Test your progress with interactive drills in comprehension and grammar and instantly check your answers. \$99, The Hyper-Glot Software Co., 615-558-8270.

Microsoft Bookshelf for Windows: See how things work and hear how words sound in this fully indexed collection of reference books that relies on animation, sound, graphics, and hypertext: *The Concise Columbia Encyclopedia*, *The American Heritage Dictionary*, *Roget's II Electronic Thesaurus*, *The World Almanac and Book of Facts*, 1991, *Bartlett's Familiar*

Quotations, *The Concise Columbia Dictionary of Quotations*, and *Hammond Atlas*. \$195, Microsoft Corp., 800-426-9400.

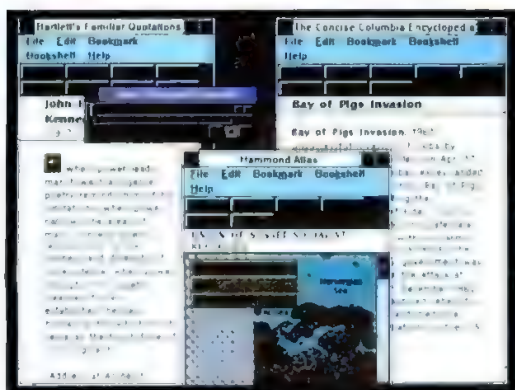
PLAYING

AmandaStories: Kids play interactively with an adventurous camel and cat whose adorable journeys are filled with colorful animation, music, and sound effects. Three year olds and up create different stories by pointing and clicking, no reading required. \$59.95, The Voyager Co., 800-446-2001, 213-451-1381.

Living Books: Animated storybooks with digitized soundtrack of talking characters, music, and sound effects are read aloud in English, Spanish or Japanese. Children from three to ten years old play and learn inside the story by clicking on individual words, characters, and scenery. *Just Grandma and Me* is the first in a series. \$49.95, Broderbund Software, 415-492-3200 (available Jan. 1).

Multimedia Beethoven: The Vienna Philharmonic performs The Ninth Symphony. Listen to compact disk recording, follow the score as you absorb the commentary of a noted music professor. Learn about the composer's era and gain an appreciation of classical music. \$79.95, Microsoft Corp., 800-426-9400.

Master Trax Pro: Add high-quality music to multimedia presentations with this professional MIDI sequencer made expressly for multimedia producers and musicians. Record and playback soundtracks, arrange compositions, and synchronize with SMPTE and MIDI time code. \$395, Passport Designs Inc., 415-726-0280.



for Microsoft Windows with Multimedia Extensions, and the ability to run on MPC hardware.

From presentation tools to children's stories, MPC-supporting software adds new dimensions to traditional computing. Some old favorites such as OWL International's *GUIDE*, Sierra On-Line's *Mixed-Up Mother Goose*, and Maxis' *SimCity* will be revamped for the multimedia PC. We've listed a sampling of titles; for a catalog of close to 60 titles you can contact the Multimedia PC Marketing Council at 1730 M St. NW, Washington, D.C. 20036.

New Close-Up. the Remote with Record-Breaking Speed

Now Supports
Windows
& DOS



No more waiting for your screens to paint! Close-Up lets you work faster, more productively with the fastest screen refresh, interaction and response time ever seen!

To paint the Lotus graphic pcAnywhere IV took 1 minute, 57 seconds. Almost 2 minutes. That's like having to sit through four TV commercials.

Carbon Copy 6.0 took a full 4 minutes, 54 seconds. Almost 5 minutes. That's like waiting through five traffic lights.

How fast did Close-Up paint it? The results will astound you.

10 seconds.



That's right. 10 seconds is all Close-Up took to paint the screen and let you continue working.

Take the Close-Up Challenge.

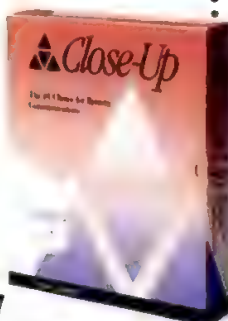
Try it for yourself. If you're not absolutely convinced that Close-Up 4.0 is the fastest remote program, we'll give you your money back.*

Risk-Free Introductory Offer!

Now for a limited time you can get your new Close-Up 4.0 Dual Pack, including both sides, Customer/Terminal & Support/ACS, for only \$199. That's a savings of over \$240 and includes our Risk-Free, 30-Day Money-Back Guarantee!*

Upgrade Now!

Upgrade your current remote program to new Close-Up 4.0, the fastest remote around. Get Customer/Terminal or Support/ACS for only \$49 each!*



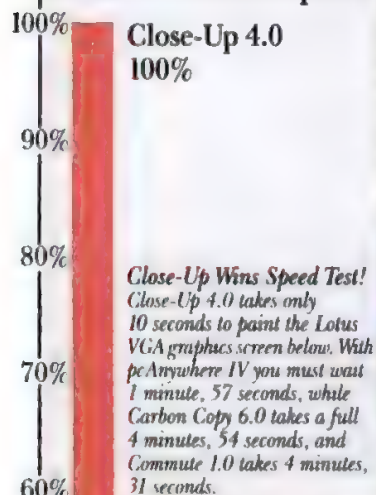
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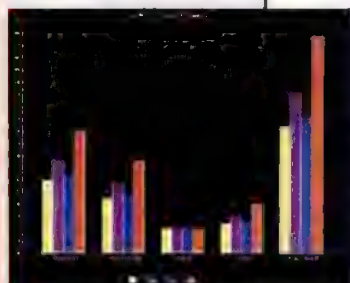
P.O. Box 4085, Santa Barbara, CA 93140 USA
Phone 805-964-6767 FAX 805-683-5679

Remote Screen Speed



Close-Up Wins Speed Test!

Close-Up 4.0 takes only 10 seconds to paint the Lotus VGA graphics screen below. With pcAnywhere IV you must wait 1 minute, 57 seconds, while Carbon Copy 6.0 takes a full 4 minutes, 54 seconds, and Commute 1.0 takes 4 minutes, 31 seconds.



Lotus 1-2-3 graph.

First with Windows and Fast Graphic Speed.

New Close-Up 4.0 is the first remote technology that lets you remotely view and control any Windows[®] or DOS application on another PC miles away.

We first introduced remote communications in 1980, and developed

virtually every major feature that's now the standard for remote technology.

Today Close-Up is licensed by industry leaders including 3Com, Ashton-Tate, Borland, DEC, Hewlett-Packard, IBM, Lotus, Microrim, Novell and Tektronix.

Proof that Close-Up is Fastest.

You can prove how fast new Close-Up really is: Take the Close-Up Challenge.

Reproduce our test¹ and see for yourself that new Close-Up 4.0 is the fastest remote program.

We took a standard VGA color graph from Lotus 1-2-3 and compared the top 3 remote programs—Close-Up, Carbon Copy, and pcAnywhere—to see how long each would take to paint a graphic screen. The results were very convincing. Read on!

In the time it takes Close-Up to paint 100% of the above Lotus VGA graph, pcAnywhere IV has painted just 8.6%, Carbon Copy 6.0 has painted just 3.4% and Commute 1.0 has painted just 3.7% of the graph.

¹We invite you to reproduce our Remote Screen test. The graph used was a color VGA graph found in Lotus 1-2-3 Release 2.2, on the "Sample Files Disk." The file is TUTOR9X.WK1. The PCs were Everex 16 MHz 386/SXs and the modems Hayes 2400 baud Smartmodems. The baud rate was 2400.

*Only Close-Up passes the Windows test. 1. Total remote keyboard and mouse support in all Windows modes: 386 Enhanced, Standard and Real. 2. Remotely run multiple Windows applications and multiple (full screen or windowed) DOS applications simultaneously. 3. Use a mouse to remotely cut & paste between windowed DOS applications and Windows applications.

First Looks

IconAuthor: Multimedia Authoring Made (just a bit) Easier with Innovative Flowchart Metaphor

HANDS ON
by Robert Kendall

AimTech Corp. was among the first to develop multimedia authoring tools for the Windows environment. Now, with *IconAuthor*, Version 4.0, it's one of the first companies to harness the power of Microsoft's Multimedia Extensions.

In addition to orchestrating the flow of a multimedia piece, *IconAuthor* provides the tools for creating and editing graphics and animation sequences. To further embellish your work, you can take advantage of its support for an arsenal of hardware including full-motion video, digitized audio, synthesized music, and material accessed from CD-ROM or audio CD.

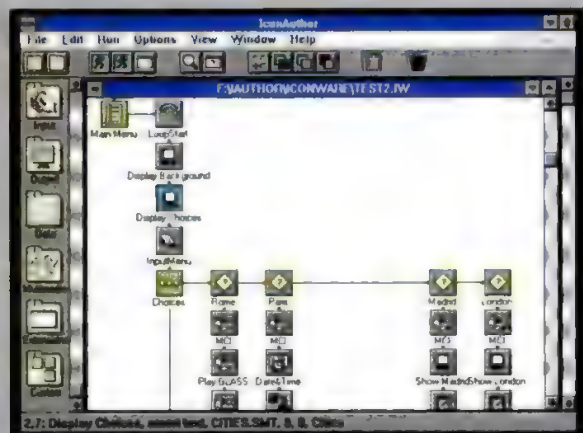
The program's innovative graphical interface—which uses a flowchart metaphor—makes it easy to design complex branching applications. By dragging an icon from a toolbox onto the work area, you create the backbone of your presentation. For example, you can have an icon that serves as a placeholder to display a graphic, manipulate a variable, or

pause for user input. Using icons you can do all of this without writing a line of code. Flowchart lines link the icons and indicate conditional branching. You can quickly map out your entire application with icons and then go back to supply the content.

Content is added by supplying information to the dialog boxes that are attached to each icon. Once you place an icon in the work area, a dialog box appears and prompts you to provide parameters that, for example, name a .PCX file for display or specify a database operation to perform.

Reorganizing your work is especially easy since you can drag icons individually or in groups. You can display two applications—or different parts of the same application—in adjacent windows, and drag icons from one to the other. Ribbon bar commands let you zoom in on your work area or disable selected icons.

The flowchart metaphor provides an intuitive way to build an application, but when it comes to filling in the details, things aren't quite as smooth.



IconAuthor lets you build an application by dragging function icons from the library strip on the left of the screen into a flowchart.

IconAuthor can create interactive presentations with complex branching. This menu was created by overlaying graphics and Smart Text.



It's too easy to enter invalid parameters in the dialog boxes and find out only at runtime when you get error messages. And some drop-down selection lists, such as the one for fades and wipes, give you only a few options; you have to type in the others yourself.

IconAuthor has several well-integrated and easy-to-use editing modules. The program can display four graphics formats: .BMP, .PCX, compressed .BMP, and Windows Metafiles. Its graphics editor provides basic drawing functions.

Its Smart Text editor enables you to create very attractive boxed text. Since the text editor is vector based, you can freely move boxes, redefine frame styles and fonts, or hide frames. Whenever you resize a box, the text will reformat accordingly. You can even enter variables in the text, and the correct values will display at runtime. IconAuthor provides no fonts of its own, so if you want to avoid Windows' crude screen fonts, you'll have to turn to third-party vendors.

Another editor lets you create sprite animation sequences. To define an animation path, simply point to the start and end positions or trace a nonlinear path. There's no way to build frame-based animations, but animations from Autodesk's Animator can be used if you obtain the proper DLL and driver files from Autodesk.

The program's extensive support for full-motion video overlay lets you superimpose either a graphics image or a menu that lets the viewer fast-forward, reverse, or branch on top of a working sequence.

Working with robust data-

handling functions, you can build such activities as quizzing a user and then recording his or her score. Your application can create dBASE files, update them based on user input, or search them upon user request.

AimTech has hastily tacked on support for the audio capabilities in Multimedia Windows by using an MCI (media control in-



FACT FILE

IconAuthor, Version 4.0
AimTech Corp., 20 Trafalgar Sq., Nashua, NH 03063; 800-289-2884, 603-883-0220.
List Price: \$4,995.
Requires: 1MB RAM (2MB RAM for 256-color graphics), DOS 3.1 or later, Windows 3.0, 25-MHz 386 and 4MB RAM recommended.
In Short: IconAuthor is a powerful authoring system that puts all the capabilities of a multimedia PC to good use. Its innovative flowchart interface makes complex application development manageable, though it is targeted primarily at professional media makers.

CIRCLE 767 ON READER SERVICE CARD

terface) icon that gives direct access to MCI devices. MCI commands give you full control over MIDI, MPC-compatible audio digitizing boards, and CD audio, but the program offers little help with entering the syntax and filenames for MCI command strings.

While its price makes IconAuthor a specialized product for professional multimedia makers, it does prove capable of most authoring tasks. And despite a few rough edges, IconAuthor's slick interface can save you hours of development time.

File Edit Worksheet

(C0) [W12]

A:E10

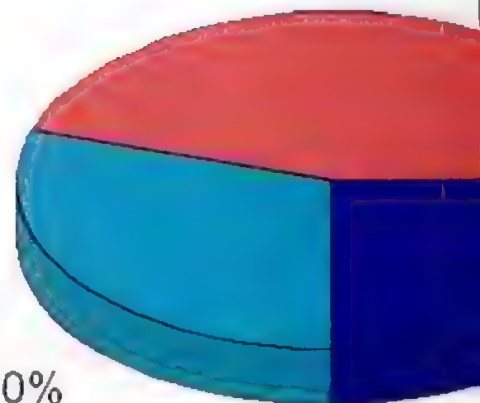
@SUM(B

	A	B
9		
10	Revenues	\$1,260,000
11	Costs	\$850,000
12	Profit	\$410,000



Market Share

45.0%



30.0%

LOOKING FOR A NEW COMPUTER?
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1-2-3 for Windows



Amipro

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1-2-3[®] for Windows

Now included in every



For a limited time only, ZEOS Windows systems buyers will also receive Lotus 1-2-3 for Windows plus Ami Pro 2.0, the Lotus Word Processing package for Windows. Complete and fully documented!

Your new ZEOS Windows system includes Microsoft Windows Version 3.0 plus a genuine Microsoft Mouse.

Unbelievable? Believe it! Because now, when you buy any new ZEOS Windows[®] system, you will also receive Lotus 1-2-3 for Windows plus Lotus' new word processor for Windows, *Ami Pro*[™] 2.0 at no additional charge!

It's the ultimate bundle! First, you're going to be receiving the incredible new ZEOS modular system complete with the upgradable CPU of your choice. These new ZEOS systems are the hottest computers money can buy. And that's just for starters.

Because you're also receiving the hottest software money can buy. Yet you don't have to buy it. Because we're including it at *no additional charge*. Go ahead and pinch yourself, it's really true!

And not only are you receiving the *amazing* new Lotus 1-2-3[®] for Windows and *Ami Pro* 2.0, you're also getting Microsoft[®] Windows itself, plus a genuine Microsoft Mouse plus Microsoft DOS 5.0. All included at one low package price.

These are not some scaled down versions or trial disks either. They are the *complete* and *fully documented* editions of Lotus 1-2-3 for Windows and Lotus *Ami Pro* 2.0 for Windows provided to you by special arrangement between ZEOS and Lotus. This is one incredible value that no one else can offer. You're going to love it, too.

Because nothing else brings out the power of the most powerful software like your blazing new ZEOS system. And when you strap your-

plus Ami Pro[®] 2.0!

ZEOS Windows System.

The foundation of your new ZEOS Windows system is the computer itself. You'll get an upgradable processor module, super-fast 53ns DRAM, a 300 Watt power supply, and lots of bays and slots for future expansion. The hardware simply can't be beat.



Wrap your Windows system up with the latest and greatest DOS version, Microsoft DOS 5.0! Fully featured and fully documented. You're going to love it!

self in and fire up *Windows* with *Lotus 1-2-3* and *Ami Pro*, you're in for the ride of your life!

After all, nobody knows spreadsheets better than Lotus. And when they sat down to write *1-2-3 for Windows* they created a masterpiece. It starts out as a full-fledged *Windows* application. Offering that perfect balance of power and simplicity, it remains fully compatible with all the earlier versions of *1-2-3*. And it's absolutely loaded with new features.

Power, Simplicity, complete Compatibility *plus* loads of new features. It's *Lotus 1-2-3 for Windows* and it comes with every ZEOS Windows system. And so does *Ami Pro 2.0*!

After all, *Ami Pro 2.0* is the Lotus word processing program that was designed for

Windows from the ground up. Linking with a full suite of *Windows* applications *including* your new *Lotus 1-2-3 for Windows*, *Ami Pro 2.0* is perhaps the finest word processor on the market today.

Buying your new ZEOS Windows system is possibly the best purchase decision you'll ever make. Then add to it *Lotus 1-2-3 for Windows*, *Ami Pro 2.0* plus *Windows 3.0*, *DOS 5.0* and a genuine Microsoft mouse. It's an offer that can't be beat and one we simply can't offer for long. So pick your new ZEOS Windows package now and we'll include a bundle! **Call now 800-423-5891!**

Upgradable. High Performance. Low Cost. And every ZEOS Windows system comes with Lotus 1-2-3 for Windows and Ami Pro 2.0 at no additional charge. Absolutely incredible!

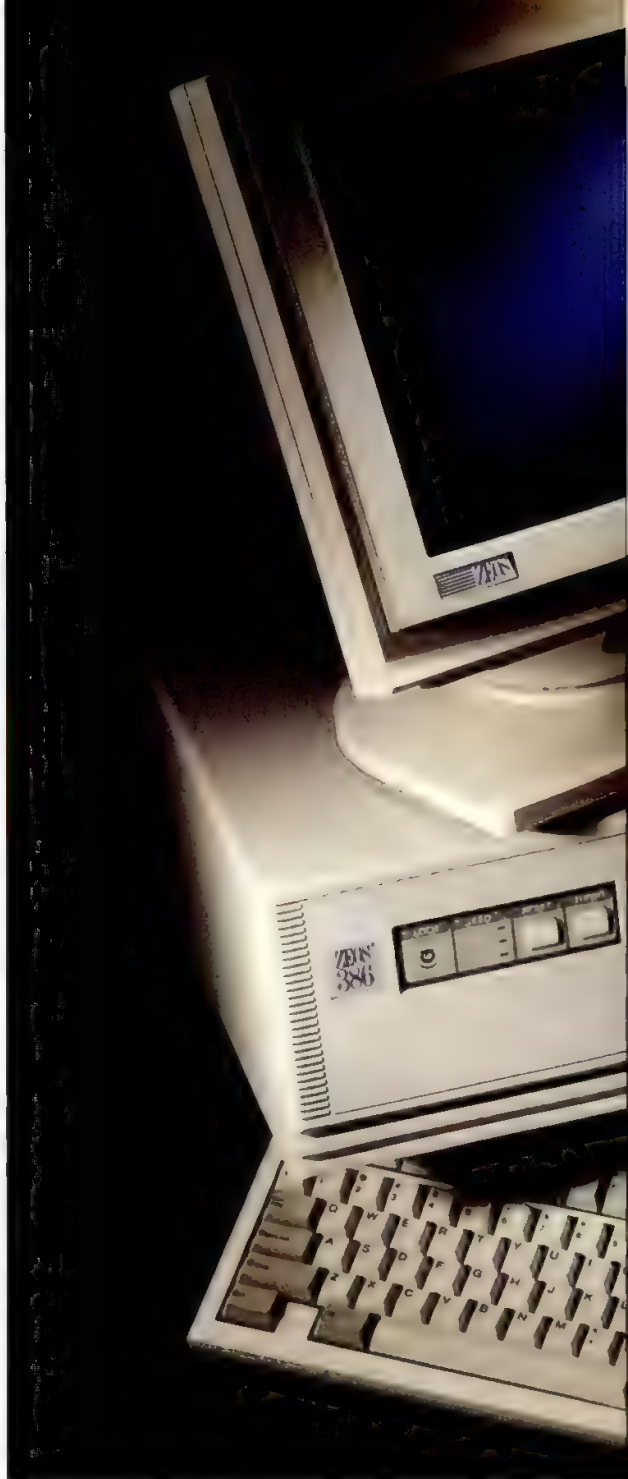
With ZEOS 386-25s starting at only \$1395 right thru '486-33MHz systems starting at \$1795, computing will never be the same again! And it's not just the prices that make these new systems hot. It's Performance and Upgradability as well.

**UPGRADABLE
CPU**

When we first sat down to design these new systems, we wanted computers that would *blow the doors off* anything else out there. Plus, we wanted you to be able to upgrade from one CPU to another as your computing requirements changed, *without having to buy an entirely new system*. The results?

Incredibly low cost, high performance systems so very advanced you can move freely from the '386 family of processors to the latest '486s all without a moment's hesitation.

Now, you can pick your power! Today *and* tomorrow. Choose from high speed '386-25 and 33MHz systems, either-cached or non-cached, plus the '486SX and '486-33MHz with or without a secondary cache. Whichever you decide upon you know that as your computing requirements change, your processing power can change as



Upgradable.

Hot New ZEOS '386

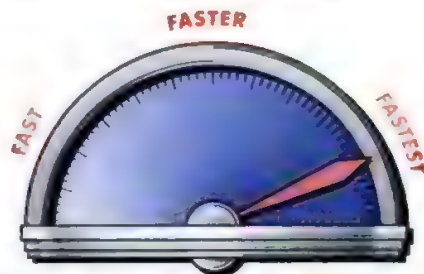
well. But are the prices really that good?

Yes. *Absolutely Yes!* The prices really *are* that good, and the quality too. Because when you buy from ZEOS you're buying directly from the manufacturer. Starting with the main system board, your new computer is designed and built by us right here in Minnesota. That saves money for you. And your ZEOS factory direct advantages are evident not only in the price, but in the performance and quality of your system too.

Not only that, but your new ZEOS system is supported around the clock by our 24 Hour a Day Toll Free technical support hotline. Should you have any questions, we're here to help, 24 hours a day, 365 days a year!

So if you're looking for a high speed, upgradable, rock solid system supported like none

other *and* you want incredibly low prices, you've found your company. And your computer. Read on!



Z-SPEED METER

To help you select the processor option that's right for you, we have developed the Z-Meter. The Z-Meter shows you the relative performance gains achieved by moving from one processor module to another—fast, faster, fastest! No matter which system you select you can be sure of one thing—these babies are Hot!

It's ZEOS and you'll save much of your money saving upgradable system package based on processor type. For a limited time only, every ZEOS Windows system includes Lotus 1-2-3 2.0 at no additional charge! Call 800-423-5897.

Low Cost.

and '486 systems!



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- The Processor and Speed of your choice plus future upgradability!
- 1MB of High Speed 53ns DRAM, expandable to a system total of 32MB right on the motherboard.
- 42MB High Speed IDE hard drive with its own cache.
- 1.2MB or 1.44MB Teac® floppy drive.
- ZEOS 14" flat screen Hi-Res amber monitor with Tilt/Swivel base.
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- Two Serial, one Parallel & one Game Port built right onto the motherboard.
- 7-16, 1-8 bit expansion slots. 80387 math co-processor support for '386 systems.
- Rugged ZEOS SpaceSaver case with twin cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion!
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

PACKAGE #1

INCREDIBLE ZEOS PACKAGE #2

We take Package #1 and upgrade your ZEOS Modular System to include:

- 2 full Megabytes of Rip-roaring 53ns DRAM.
- Our incredible 85MB IDE hard drive with its own built in cache.
- Both the Teac® 1.2MB and 1.44MB floppy drives.
- The awesome Diamond SpeedStar Plus VGA graphics card Complete with 1MB DRAM.
- ZEOS 14" High Res VGA Mono Monitor with Tilt & Swivel base.
- Lotus 1-2-3 for Windows, plus Ami Pro 2.0, plus Microsoft Windows and DOS 5.0, plus a genuine Microsoft mouse!

PACKAGE #2

ZEOS. Your



For Vertical Systems add only \$150.

Harnessing the ZEOS power and value you want is easy. Pick your processor then your package. Package #1 gets you up and running for a very reasonable price. To add even more options *and*

savings select from Packages 2, 3 or 4.

Because when you select from Packages 2, 3 or 4 you receive VGA, additional memory, larger drives and more.

You also receive *Windows 3.0* plus *Lotus 1-2-3 for Windows* plus Lotus' great new *Windows* word processor *Ami Pro 2.0*, plus Microsoft *DOS 5.0*

plus a genuine Microsoft Mouse. Nobody

gives you this combination of hardware *and* software power. And it's yours, all for one low package price!

And that's just for starters. Because *inside* your new ZEOS system rests the very latest advancements in surface mount, high integration technology. As an example, we have freed two normally occupied expansion slots by placing our high speed IDE hard drive and

floppy drive interfaces right on the main board. Then, we put the high speed serial, parallel and game ports on the motherboard too. The result?

Eight expansion slots, *seven* of which are available for your future use! After all, expansion and non-obsolescence are what these great new ZEOS systems are all about. We've built in some other very important expansion features for you as well.

Like our *300 watt* power supply. Providing you with all the pure clean power you'll need right now, your ZEOS 300 watt supply also provides you with plenty of power for the future as well. Plenty of slots, plenty of power. How about space? This is where ZEOS has performed something akin to magic.

It's your new ZEOS SpaceSaver case! Complete with *seven drive bays*, this incredible case is actually *smaller* than many cases offering only five bays. We've also added a *second whisper quiet cooling fan*. Why? Because whether you expand your system or not, the cooler it

486-33 \$1795

486SX-20 \$1595

386-33 \$1495

386-25 \$1395

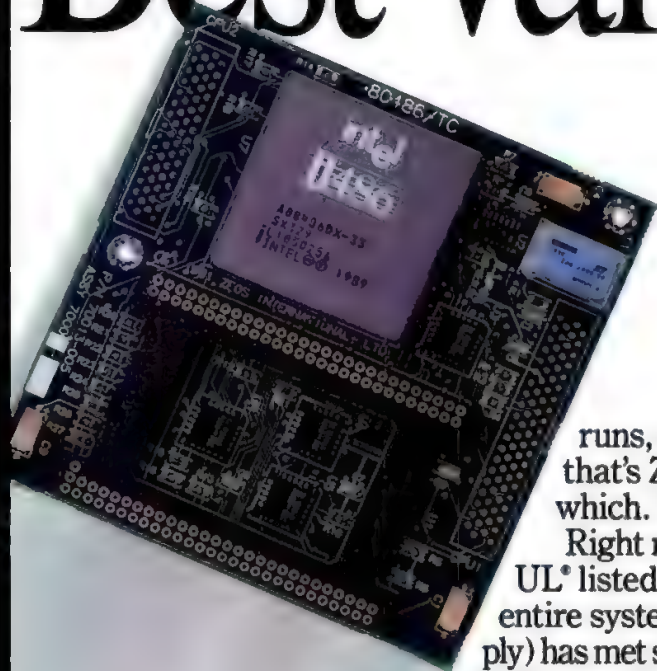
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Best Value!



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486SX-20 \$2695

386-33 \$2595

386-25 \$2495

runs, the longer it will last. Now that's ZEOS *value*. Speaking of which. How about UL® listings?

Right now every ZEOS system is UL® listed. This listing means your entire system (not just the power supply) has met stringent safety requirements of Underwriters Laboratories. We believe

UL® listings also say a lot about quality. And UL® safety listings are something many of our competitors simply don't (or can't) provide. At ZEOS quality and safety are important to us. *You* are important to us.

Price. Performance. Quality and Support.

There are *many* reasons to buy your new ZEOS upgradable system. Plus, your ZEOS advantages include *24 Hour a Day Toll Free* Support and our 30 Day Money Back Guarantee and ironclad warranty (for more ZEOS advantages see the section entitled "*Why ZEOS is Your #1 Choice*").

Selecting your new ZEOS system is easy. Choose from any of the money saving packages shown here. Or let your friendly and knowledgeable ZEOS Systems Consultant help you configure exactly what you want from our huge selection of upgrades and options. Whatever you select, one thing is for certain.

Buying your new ZEOS system is perhaps the best purchase decision you'll ever make! Simply pick up the phone and give us a call now. Incredible ZEOS power awaits you! *Call now Toll Free, 800-423-5891.*

486-33 \$3395

486SX-20 \$3195

386-33 \$3095

386-25 \$2995



For Complete Processor and Package Pricing, simply turn the page!

Pick Your Package

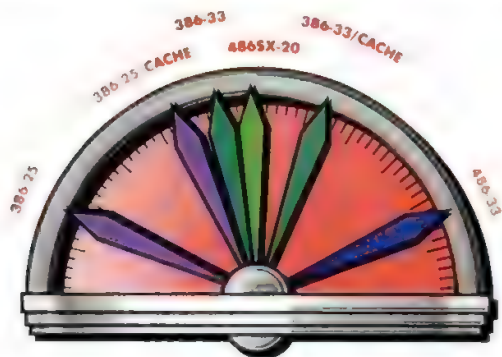
Or Let Us Custom Build to

Now, ZEOS lets you pick the power you want for the price you want to pay! Not only that, every ZEOS Windows System (Packages 2, 3 and 4) includes not only Microsoft *Windows*, *DOS* and a mouse—we're also including Lotus *1-2-3 for Windows* plus Lotus' new Windows word processor *Ami Pro 2.0*!

And with your new ZEOS modular system, the computer that's right for you today is also the computer that's right for you tomorrow. In the future, you can upgrade to even more performance with a new '386 or '486 processor module.

And that's only the start of your many ZEOS system advantages. But what more could there be than dazzling performance, incredible prices and upgradability? From ZEOS there's lots more.

Because your new ZEOS system is not only fast, it's absolutely loaded with features. Like our 300 watt power supply, eight expansion slots, twin cooling fans (for even more reliability) and our unique seven bay SpaceSaver case. And, every ZEOS system is UL® listed.



Z-SPEED METER

Let the "Z-Meter" help you pick the processing power that's right for you. The comparisons are easy to make. Fast, Faster or Fastest!

Power, & Price!

Your Exact Specifications.

PACKAGES 2, 3 AND 4 INCLUDE LOTUS BUNDLE!

	Pkg. #1	Pkg. #2	Pkg. #3	Pkg. #4
386-25	\$1395	\$1995	\$2495	\$2995
386-33	\$1495	\$2095	\$2595	\$3095
486SX-20	\$1595	\$2195	\$2695	\$3195
486-33	\$1795	\$2395	\$2895	\$3395

Add \$200 to any price for a 128K cache.

In addition to all of these standard ZEOS advantages, you're also receiving our legendary ZEOS Technical Support, *24 Hours a Day, 365 Days a Year*. Plus, our 30 day Absolute Satisfaction Money Back Guarantee and more!

So pick your Power, and your Price *then give us a call!* Your expert ZEOS Systems Consultant is ready to answer any questions you may have. Why not give us a call right now, Toll Free at 800-423-5891.

INCREDIBLE ZEOS PACKAGE #3

Add even more memory, a larger drive. And more Savings! You now receive:

- 4 full Megabytes of Ultra High Speed 53ns DRAM.
- Our fast 130MB IDE hard drive with built in cache.
- Both Teac[®] floppies, the 1.2MB and 1.44!
- Your Diamond VGA Plus card with 1MB DRAM.
- ZEOS 14" 1024x768 VGA Color Monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0, Microsoft Windows, DOS 5.0 *plus* a Microsoft mouse!

PACKAGE #3

THE ULTIMATE ZEOS PACKAGE #4

Now, Memory goes to 8MB and the drive to 210MB. The ultimate Power User's Dream Machine!

- 8 full Megabytes of High Speed 53ns DRAM.
- Your screaming 210MB IDE hard drive with its own built-in cache.
- Both Teac[®] floppies, the 1.2MB and 1.44!
- The Diamond VGA Plus card with 1MB DRAM.
- ZEOS 14" 1024x768 VGA Color Monitor w/Tilt & Swivel.
- Lotus 1-2-3 for Windows, Ami Pro 2.0, Microsoft Windows, DOS 5.0 *plus* a Microsoft mouse!

PACKAGE #4

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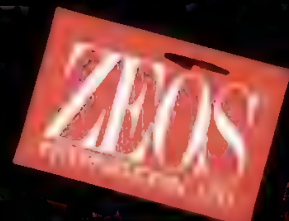
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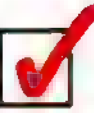
Leasing Programs.

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365 Days a Year!



Why ZEOS is

 Now, your ZEOS modular system allows you to upgrade from one CPU to another as your computing requirements change. Obsolescence is virtually obsolete!

 You may choose between a variety of '386 and '486 processor options, both cached and non-cached.

 Made in USA! Your new ZEOS system boards are designed and manufactured by ZEOS, right here in the USA.

 ZEOS has utilized the very latest in highly integrated surface mount technology. Faster, cooler, more reliable systems for you!

 Every ZEOS modular system comes standard with incredibly fast *53 nanosecond DRAM*.

 Plus, you may expand your system with up to 32 megabytes of memory right on the motherboard.

 Your new system features the *exclusive* ZEOS seven bay desktop case, smaller than most five bay cases yet plenty of room for future expansion.

 Two whisper quiet cooling fans move more cool air thru your system increasing reliability and component life.

CHECK YOUR EXCLUSIVE

If you're deciding which new computer to buy, there are many important considerations.

Here, we've gathered together a number of these considerations for your review. Some are of obvious importance,

**ZEOS.
Eight Times
Editor's Choice.**

 Your *entire* system is UL* listed (not just the power supply). Few others offer this security; we wonder why.

 Eight slots, one for the video, seven more open providing plenty of room as your system requirements grow.

 Two high speed serial ports, one parallel port and one game port.

 Our top quality 300 watt power supply provides you with plenty of power for your present *and* future needs.

 ZEOS uses *only* genuine Teac® floppy drives. Accept nothing less.

 Monochrome TTL systems feature Genuine Hercules® brand graphics controllers. Only the best for you.

Your #1 Choice!

ZEOS ADVANTAGES:

while others are subtle yet critical to your ultimate satisfaction. We'll go over them here with you one by one.

Please feel free to use these as a basis for comparison with other system vendors. We believe you will come away with the conclusion that ZEOS is indeed Your #1 Choice.

 VGA color systems feature the high-res ZEOS 1024x768 monitor with the incomparable SpeedStar Plus card complete with One Full Megabyte of memory!

 Special package savings are available incorporating our most popular upgrades. Many packages include Microsoft® DOS plus Windows and a Mouse!

 For a limited time every ZEOS Windows system also comes with Lotus 1-2-3 for Windows plus Lotus' incredible new Windows word processor *Ami Pro 2.0*!

 *PC Magazine* said ZEOS offers "more options than even the most configuration hungry hound could possibly need." Let us build whatever you require.

 Everybody loves ZEOS' 24 Hour a Day Toll Free Technical Support. You can call for advice any time of the day or night, 365 days a year!

 ZEOS systems have been selected by *PC Magazine* as *Editor's Choice, Eight Times!* These, along with many other consumer and industry awards attest to ZEOS' consistent and outstanding value.

 Your new system is backed by our 30 Day Absolute Satisfaction Money Back Guarantee, One Full Year Limited Warranty and our Express Replacement Policy.

 Buy with confidence. ZEOS is a strong and rapidly growing public company (NASDAQ Symbol: ZEOS). We've been around since 1981. We'll be around for a long time to come as well.

 ZEOS offers you a wide variety of payment options including MasterCard, VISA, Discover, American Express plus our own Z-Card, the ZEOS credit card featuring low consumer rates. Credit terms are also available along with very attractive leasing programs to qualified corporate customers.

 Friendly, knowledgeable ZEOS Systems Consultants are available 24 Hours a Day by calling 800-423-5891. You can call any time.

When you add it all up, there's nothing like buying from ZEOS. There is certainly nothing like these new ZEOS systems!

**CALL NOW TOLL FREE:
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Computers Now! SM

Take Your Pick. We'll Ship Today!

RIGHT NOW. GUARANTEED!*

Yes, we can ship your new ZEOS '386 or '486 today! We've built up an extra supply of the hottest selling computers in America in their most popular configurations.

Here's how it works. We have these incredible ZEOS '386 and '486 color VGA systems pre-built and ready to ship. While supplies last, we will ship any of these systems to you *the day you order* subject to these conditions:

1. Your order must be received by 1PM Central Time M-F.
2. Credit Cards are subject to authorization.
3. Orders must be for ZEOS '386 or '486 systems configured as shown here. Any other systems or upgrades are custom built and will take slightly longer.



**Yes! We can ship
your new ZEOS system
Right Now!
Place your order
by 1:00 PM Central
Time and we'll ship
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***OUR GUARANTEE TO YOU:**

If we accept your order for immediate shipment and fail to ship your system under the conditions outlined, we will ship it at *our expense* as soon as it is ready.

This offer is good only as long as these pre-built systems remain in stock; please give us a call to verify availability. This offer does not apply to other ZEOS systems or custom configurations.

IMMEDIATE SHIPMENT IS ONLY PART OF THE STORY.

These are not just any computer systems. They're the high performance, high quality ZEOS *upgradable* systems. Packing all the ZEOS value that has won PC Magazine Editor's Choice—*eight times!*

So why not give us a call right now. If we hear from you by 1:00 this afternoon, we'll get your new system on the way to you today! Call now Toll Free 800-423-5891.

Purchase orders from Fortune 1000 companies, Governments and institutions subject to approval. Leasing programs available. All prices and specifications subject to change without notice. Please call to confirm pricing, specification and warranty details. The following are trademarks of their respective corporations: Microsoft, MS-DOS and Windows of Microsoft Corporation; ZEOS, Computers Now!, SpaceSaver, SuperCase and Z-Card of ZEOS International Ltd. © ZEOS International Ltd., 530 5th Avenue, N.W., St. Paul, MN 55112 USA. ZEOS is a publicly traded company, NASDAQ symbol. ZEOS. Lotus is a registered trademark of Lotus Development Corporation. Ami Pro is a trademark of Samna Corporation, a wholly-owned subsidiary of Lotus Development Corporation.

Our most popular '386 & '486 packages! 128K Cache, 130MB Drive, 4MB Memory and More. Ready to ship today!

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As a '486-33 ONLY \$3095!

- Upgradable CPU module allows you to change processors as your computing needs change!
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- Ultra Fast 130MB IDE Hard Drive.
- 1.2MB and 1.44MB Teac® floppies.
- ZEOS 14" High Res 1024x768 VGA Color Monitor with Tilt/Swivel base.
- High Speed 16-bit Diamond SpeedStar Plus VGA 1024 color graphics card with 1MB RAM!
- Lotus 1-2-3 for Windows, *plus* Ami Pro 2.0, *plus* Microsoft Windows and DOS 5.0, *plus* a genuine Microsoft mouse!
- Shadow RAM and EMS support for enhanced performance.
- ZEOS/RS 101 key SpaceSaver keyboard.
- High Speed ZEOS I/O with two Serial, one Parallel & one Game Port built in.
- 7-16, 1-8 bit expansion slots. Math coprocessor support for '386.
- Rugged ZEOS SpaceSaver Case with two cooling fans for added reliability and product life.
- Seven drive bays and our custom 300 Watt power supply for your future expansion.
- Includes ZEOS 24 Hour a Day Toll Free Technical Support and Customer Satisfaction package.

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Open 24 Hours a Day, 365 Days a Year!



First Looks

Faster Processor and Lower Price in HP LaserJet IIP plus



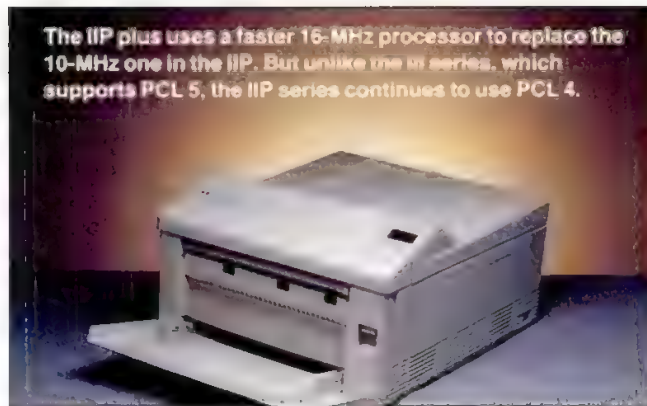
Hewlett-Packard has announced another laser printer—this time it's a replacement for their personal laser, the LaserJet IIP. In keeping with HP's marketing tradition, the new LaserJet IIP plus printer costs less and has more features. But unlike most of HP's printer replacements, this acorn hasn't fallen very far from the tree.

There is almost no difference in the list prices of the old IIP and the new printer. The IIP carried a list price of \$1,295, and the IIP plus comes in just \$46 lower at \$1,249. This pricing seems a bit cramped in the light of the new IIIP's \$1,595 list price. Since the IIP will be discontinued, the IIP plus will

be the entry-level LaserJet, with a street price around \$900.

The IIP plus has many of the same features as the IIP. It uses the PCL4 command language (as opposed to the III series LaserJets, which use PCL5 with scalable fonts). The IIP plus does not have the Resolution Enhancement Technology found in the LaserJet III models, which reduces "jaggies" and makes text look better. The IIP plus has only the basic 10 and 12 point Courier and 16 point Line Printer fonts. It has just 512K memory as standard. You can add up to two memory boards and one font cartridge.

What the IIP plus does have is speed. Inside, its silicon heart beats at 16 MHz instead of the IIP's 10 MHz. And like the new IIIP, the IIP plus has a new par-



allel interface design that allows it to receive data up to four times faster than the IIP.

This translates into performance speed, but only for certain types of jobs. The PC Labs text benchmark test showed that the IIP plus was slightly faster than the IIP. The IIP plus printed 4.0 pages per minute over 20 pages; the IIP clocked in at 3.9 ppm. However, the speed gains are dramatic on short runs or data-intensive jobs such as graphics. The IIP took 53 seconds to print the graphics test,

but the IIP plus was nearly twice as fast, at 31 seconds.

The LaserJet IIP plus is not a breakthrough in terms of features, price, or performance, but it does improve on HP's already impressive competitive position. HP has responded to the increasing competition at the laser printer entry level. ■

List Price: HP LaserJet IIP plus, \$1,249. Hewlett-Packard Co., 19319 Pruneridge Ave., Cupertino, CA 95014; 800-752-0900.

CIRCLE 447 ON READER SERVICE CARD

Excel Reporter: Shortcut to Labels, Forms, Reports



Excel Reporter, Version 2.1, picks up where the database features of *Excel* 3.0 leave off by turning data from *Excel* ranges into three types of attractively formatted reports: columnar listings, mailing labels, and forms. You can also produce these reports with *Excel* macros, but Zen Software's \$199 *Excel Reporter* saves lots of time and trouble.

Lots of versatility is built into its engine. You can select fields from single or multiple *Excel* tables, filter records with a wide variety of logical operators, and add calculated fields. Columnar reports can include descriptive group headers and footers as well as group statistics like sums, counts, averages, standard deviations, and variances. Mailing labels easily accommodate varying line counts. You can apply shades

and rules and use all your *Windows* fonts in any size and style.

Excel users should feel at home with the process of designing reports in *Excel Reporter*. You create report templates on a drawing-board grid framed by rulers. And worksheet tables and fields, selection criteria, and design matters can be specified with mouse clicks.

A set of built-in functions with *Excel*-like syntax assist with record selection. And *Excel* formatting strings let you customize numeric and date formats for output. A print preview command (with zoom) lets you check your work before committing it to paper.

Excel Reporter is a stand-alone *Windows* program, as opposed to an add-in, but it can run via DDE instructions from *Excel* macros. Sample macro code shows you how to create an *Excel* menu that retrieves a user's report template choice and passes it to *Excel Reporter*. An

administrator with modest macro proficiency should be able to set up recurring reports for execution by novice *Excel* users.

Excel Reporter has a few cosmetic weaknesses. The manual and program are out of sync in noncritical ways, the manual is crudely designed and edited, and there's no on-line help.

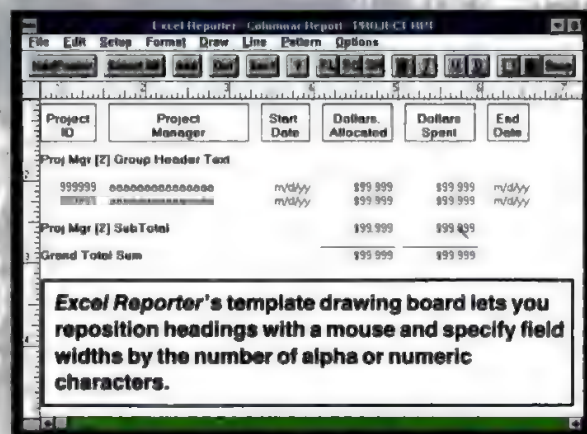
If you're new to report generators, *Excel Reporter* may be intimidating at first. Fortunately, the program is well designed

and provides excellent screen feedback. Whatever your skill level, you'll find it simpler to get serviceable database output by using *Excel Reporter* than by writing *Excel* macros. ■

List price: *Excel Reporter*, Version 2.1; \$199.

Requires: 286 PC or better, 2MB RAM, *Windows* 3.0. Zen Software Inc., 72 Bart Rd., Monroe, CT 06468; 203-268-6015.

CIRCLE 701 ON READER SERVICE CARD



First Looks

24-Bit Paint Programs: WinRIX Combines Bitmaps with Objects; Image-In Refines Selection and Opacity

HANDS ON
by Barry Simon

Not too long ago 24-bit (16.7-million color) PC paint programs required high-end, typically Targa-based hardware and high-end software whose use was pretty much restricted to professional artists. Windows' ability to handle 24-bit color has caused a recent flurry of PC activity on the 24-bit paint program front.

This past May, Zsoft's *Publisher's Paintbrush* 2.0 (First Looks, August 1991) and Ulead's *PhotoStyler* (First Looks, June 25, 1991) became the first two entries in the race. Aldus purchased the rights to *PhotoStyler* and subsequently removed it from the market to modify the interface. Aldus's \$495 *PhotoStyler* just began shipping and we will be looking at it in an upcoming issue.

Now, two old favorites are entering the 24-bit arena, each with their own set of unique capabilities. The \$495 *WinRIX* from RIX Softworks can com-

bine bitmap and vector objects on a single canvas. The \$795 *Image-In-Color* from CPI, marketed in this country by Image-In, touts sophisticated selection and opacity tools.

While these programs will

edit 16-color (4-bit) VGA files or even attempt to display an approximation of a 24-bit file with only 4 bits, you'll need at least a Super VGA card (256 colors) to use them effectively. If you intend to use them heavily, you'll want to invest in a 16-bit card (32 thousand colors) like the Diamond SpeedStar HiColor Card, or a 24-bit card (16 million colors) like the new Everex Viewpoint TC. To move all those bits we'd recommend at least a 386/20 machine with a minimum of 4MB RAM available after Windows is loaded.

Both *WinRIX* and *Image-In-Color* have a core of common painting features. Both support the most popular bitmapped formats: .BMP, .TGA, .PCX, .GIF and TIFF in up to 24-bit color. They will load, save and convert freely between formats. Both allow you to resize pictures and reduce their color depth with palette optimizing algorithms.

Each program uses the Windows multiple document interface (MDI) to allow you to work

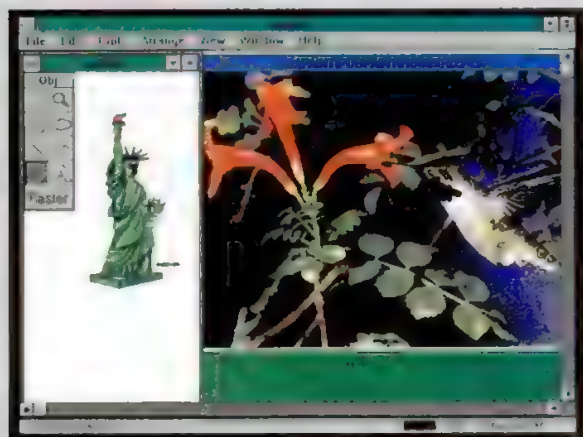
on several pictures at once. But both fall short of the competition, since neither lets you link two views of the same picture as in *Publisher's Paintbrush*. However, *WinRIX* lets you keep a copy of the original on-screen while editing.

Both programs have a variety of filters for transforming a picture with changes like motion blurring and sharpening. Since filters can only be applied to a preselected screen area, *Image-In*'s more advanced selection tools give you much more sophisticated control over filters than *WinRIX*.

Each of these programs handles gradient fills and control of opacity better than *Publisher's Paintbrush*. Both let you place a linear gradient at an angle and have a true radial gradient. And both allow you to specify an opacity level for painting images on top of one another. At 100 percent opacity, the paint totally overlays what's below it, while a lower opacity lets some of the underlying background show through. For example, you can place an opaque wash over an entire picture. *WinRIX* even lets you specify gradients with various degrees of opacity.

WinRIX and *Image-In* have some direct support for scanners, although neither comes close to supporting the dozens of scanners supported by *Publisher's Paintbrush*. *WinRIX* supports the Epson 300C, some Sharp scanners, and ProScan; *Image-In* supports the Epson 300C, the ScanJet Plus, and three Ricoh scanners.

CONTINUES ON PAGE 52



WinRIX mixes raster and vector drawing. The toolbox identifies which mode you are in and takes you from one set of tools to the other. The object layer is always "on top" of the raster layer, although there is a menu choice/hotkey to remove the view of the vectors.

FACT FILE

WinRIX, Version 1.0

RIX Softworks, 18552 MacArthur Blvd. #200, Irvine, CA 92715; 800-345-9059, 714-476-8266

List Price: \$495.

Requires: 2MB memory (8MB recommended), Windows 3.0.

In Short: The ability to mix raster and vector objects in a paint program is intriguing, but this version acts more like an early beta version than a finished product.

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First Looks

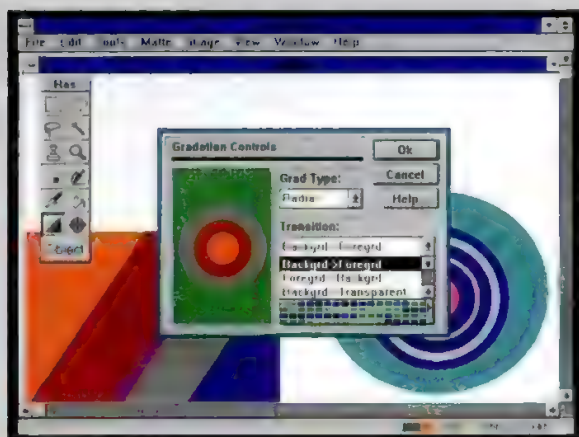
CONTINUED FROM PAGE 50

Of the two, *WinRIX* is the more innovative product, but it is plagued with problems. Many features don't work right or at all. The UAE (Unrecoverable Application Error) rate is so great that you'd be foolhardy not to sit tight and wait for an improved release.

WinRIX's most interesting feature is that it lets you place a vector object level on top of the raster/bitmap level. If you've ever added text to a raster image and noticed a spelling error the next day, you'll appreciate this as a way to keep text in an editable form. And since *WinRIX*'s vector drawing tools include rectangles, ellipses, polyline, and Bezier drawing tools as well as text tools, your objects can be complex.

You can import vector art as *Windows* metafiles, and the product ships with 69 pieces of object clip art from *Arts & Letters* and other vendors.

The manual identifies the two layers of a combined picture Rasterland and Vectorland. The floating toolbox has a button to switch from one set of tools to the other. You can view both layers simultaneously or choose to remove the vector view. You can rasterize the vector objects by using a brush with bitmap fills.



WinRIX has a variety of gradients and even allows opacity with them. Specify 100% opacity to totally overlay a background; a lower percent lets background show.

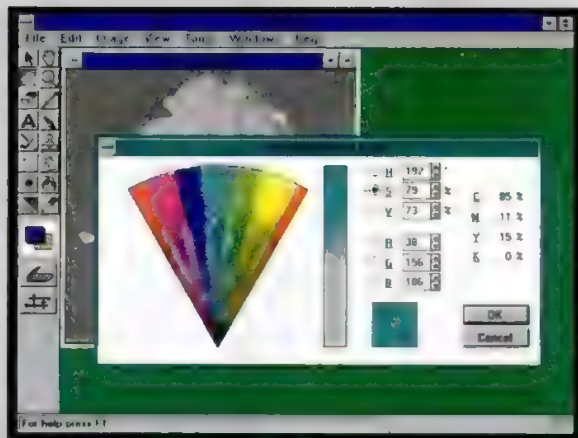


Image-In's elegant color picker uses a cube in the RGB model and a cone in the HSV model. There's also a CMYK model for Pantone separations.

While the concept of mixing raster and vector in one program (something that's been done for a while now in Mac-based paint programs) is commendable, the reality leaves much to be desired. Most of the vector clip art from *Arts & Letters* disappears when you import it because, according to the vendor, it gets painted in invisible paint.

The only way to edit vector text is to backspace from the end; you can't change the font or size of your text once you've chosen it for a text block. While the advantage of vector text is to print at printer resolutions, *WinRIX* only uses screen fonts supported through the LaserJet

print driver, and it didn't find all of mine. You also can't edit the colors of objects once they are drawn. Undo is often unavailable; for example, after editing a Bezier node or applying a rasterland filter. The Create Bezier tool didn't work in the initial release.

Gray-scale bitmaps that print out well in *Publisher's Paintbrush* and *Image-In* print as black and white images of unacceptable quality using *WinRIX*. In this version, some of the tools don't work and cause UAEs if the pixel dimensions of your picture aren't a multiple of four.

Finally, the user interface is often awkward. If you use a tool and you decide you want to start over and reselect, you need to pick another tool and then repick the first one. In all, *WinRIX* reaches for the stars, but so far falls short.

Image-In-Color is a much more solid first release. The program has a consistent, easy-to-use interface—at any time, the right mouse button pops up a menu of options for the currently chosen tool.

The selection tool is especially impressive. You can select areas of your drawing using rectangular, circular, polyline, and freehand tools. The magic wand will use the color changes in your image to try to select the shape you are pointing at. Selections can be set to add, sub-

tract or intersect with the previous selections.

The ability to select complex regions can't be underestimated, since these selections act as a mask. When using the Fill tool, Paintbrush, or other tools, paint is only applied to the region within the selected area.

Image-In has unusual and special support for all of *Wacom*'s drawing tablets. With them, the opacity of paint laid down depends on how hard you press on the tablet. Also noteworthy is the color picker. The RGB model is displayed as a cube; the HSV color model is a cone. The color picker captures the essence of these models by depicting them as a two dimensional slice and a perpendicular line, respectively.

There are some weak points in the product. The color reduction on-screen to 256 colors is not as good as the competition. The gray-scale printing, while better than *WinRIX*'s, is somewhat washed out and not as rich as *Publisher's Paintbrush*. The help is limited and lacks search facilities; the manual lacks an index. And I encountered some testing problems as well. I had TGA images that did not load correctly, and Undo didn't always work properly with gradient fills.

Image-In is a strong entry into the 24-bit arena. Many will prefer it over the current \$495 *Zsoft Publisher's Paintbrush* because of the selection and opacity features. Still, even though *Image-In* has a richer feature set than the *Zsoft* product, one wonders if the \$300 price differential is justified. ■



FACT FILE

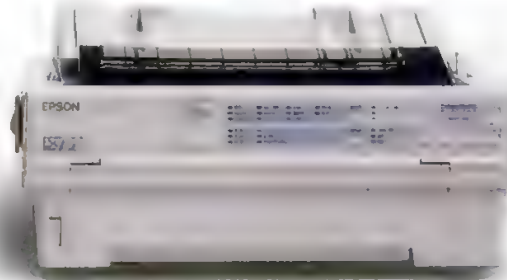
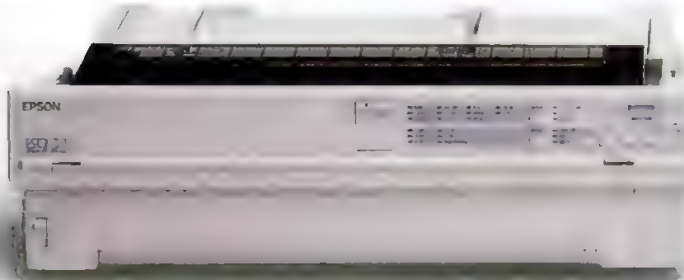
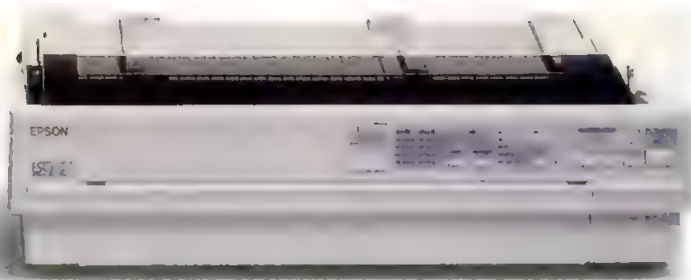
Image-In-Color, Version 3.0

Image-In Inc., 406 E. 79th St., Minneapolis, MN 55420; 800-345-3540, 612-888-3633. List Price: \$795

Requires: 2MB memory (4MB recommended), *Windows* 3.0. **In Short:** Thus far, the richest of the *Windows* paint programs, but it costs \$300 more than the others. Its selection tools and opacity options are especially noteworthy.

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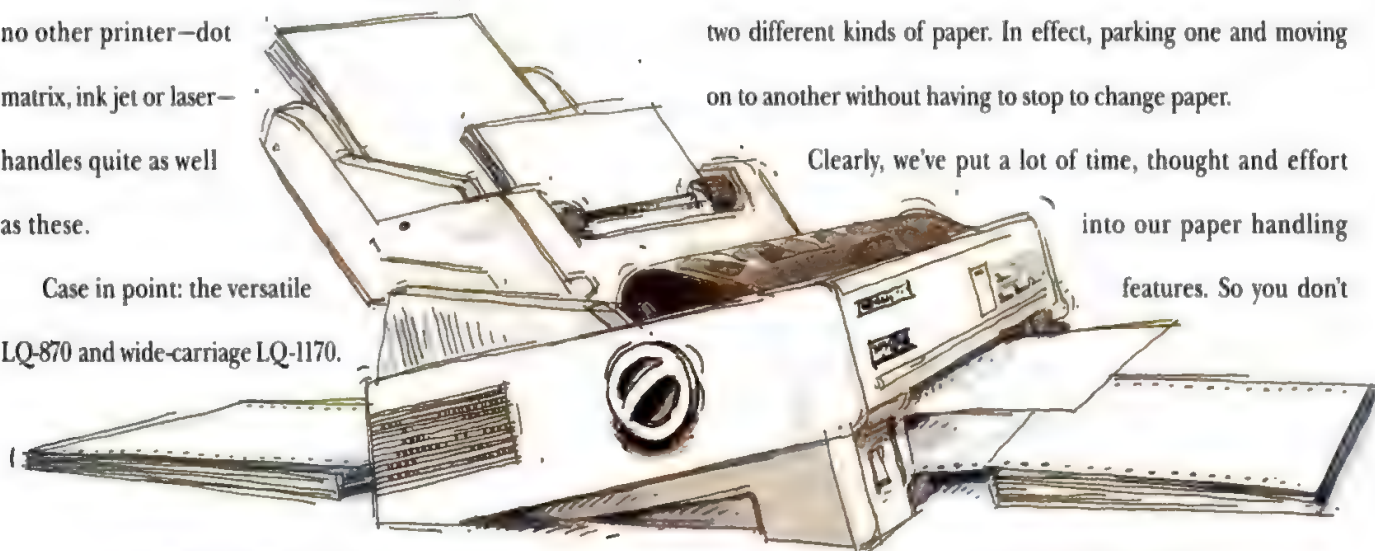
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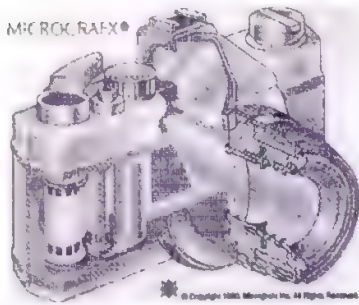
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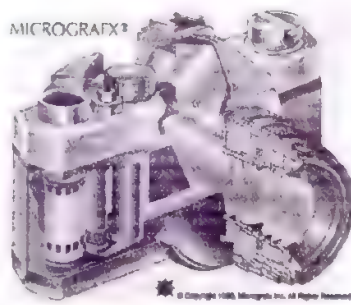
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First Looks

Create and Animate Human Models with Mannequin

HANDS ON
by Jeff Prosser

Ergonomics used to be a dirty word in mechanical design. That was before *Mannequin*, a new product from HumanCAD that interfaces with existing CAD products to make human factors an integral part of the design process.

Mannequin's forte is creating ergonomically correct 3-D wire frame models of the human body ("mannequins"). You specify the age, size, build, sex, and ethnic origin of the mannequin by filling in information in a dialog box, and then select a pose from an icon menu. *Mannequin* creates a model based on your choices. If the predefined poses aren't enough, you can alter the mannequin's position by manipulating individual body parts. *Mannequin* respects the limitations nature imposes on the real human body, so it won't let you position a model in a pose that a real human can't assume.

Once a figure is positioned the way you want it, you can export it to other programs. For export to CAD and drawing programs, *Mannequin* supports .DXF, .DRW, EPS, .PCT, .WMF, and PLT file formats. For export to paint programs,

the program supports several bitmap formats, including .PCX, TIFF, .BMP, and .GIF.

Figures don't have to be exported to be useful. *Mannequin* lets you embellish your drawings with CAD-like entities such as lines, cylinders, and spheres, and even provides limited dimensioning capabilities. Other images may be imported from CAD programs if they're stored in .DXF format. You can view the resulting scene from one of *Mannequin*'s eight predefined viewpoints, create new views yourself, or display as many as four views on the screen at once.

For help in performing reachability studies, *Mannequin* will compute the arm movements necessary to reach a specified point in space, or tell you that the point is unreachable. *Mannequin* will also display cones emanating from a figure's eyes that depict its optimum and maximum fields of vision. The program will allow you to look through the eyes of a mannequin to see what is visible and what is not.

Who can use such a product? If you're an illustrator using *Harvard Graphics* or *Corel DRAW*, *Mannequin* makes it a snap to incorporate people into your scenes, even if drawing

people isn't one of your strong suits. If you're an engineer designing glove boxes, *Mannequin* can tell you whether a proposed design will be comfortable for an "average" adult male—one who falls into the 50th percentile for height and measurements of all men in the United States. Just import the glove box, drop a 50th percentile man into the scene, and see if his arms will fit through the glove ports.

Concerned that someone more than six feet tall will have to stoop to reach the glove ports? This is no problem. Just insert a taller mannequin in the scene and see for yourself. When you're ready for the finished CAD drawing, export the mannequin and use it in the drawing to give reviewers a sense of scale.

If animation is your thing, *Mannequin* features a "walk" command that steps a mannequin through the complex series of motions that mimics walking. You can have it walk straight or follow a predefined path. For smooth animation, you can record a series of motions to disk and play them back in real time.

No software package is perfect in its early releases, and *Mannequin* is no exception. I experienced frequent system crashes running the program on a 386 in Protected mode, the result of random GP faults (a particularly nasty type of error that occurs when a Protected mode program attempts to access memory it doesn't own). The



FACT FILE

Mannequin, Version 1.10
HumanCAD, 1800 Walt Whitman Rd., Melville, NY 11747; 516-752-3568.

List Price: \$699.

Requires: 286 CPU, 2MB RAM (4MB recommended), EGA or VGA display adapter. Mouse, math coprocessor recommended.

In Short: A graphics tool that lets you build 3-D wire frame models depicting human forms in a variety of poses. Models can be manipulated, used in animations, used in field-of-view and reachability studies, or exported to CAD packages and paint programs.

CIRCLE 443 ON READER SERVICE CARD

user guide does not contain a tutorial or an index. The user guide proper doesn't even offer installation instructions; for those, you must refer to a last-minute addendum. The documentation provided isn't completely up to date. It makes reference to icons in the tool palette that do not exist and omits documentation for certain menu options.

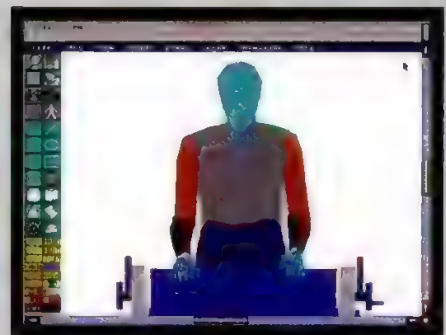
To date, *Mannequin* is the only package of its kind for the PC. Similar programs are available for high-end graphics workstations, but only at dramatically higher costs for both hardware and software. That fact alone should make the program worth its salt to you if people are an important—and sometimes neglected—part of your designs. ■



Mannequins come in a variety of shapes, sizes, and poses and have realistic limits of motion.



You select from a dialog box to define gender, body type, age, and country of origin.



Objects other than human figures can be created in the scene or imported from .DXF files in CAD programs.

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First Looks

Good Things Get Better: WinFax PRO Expands Fax Modem Support

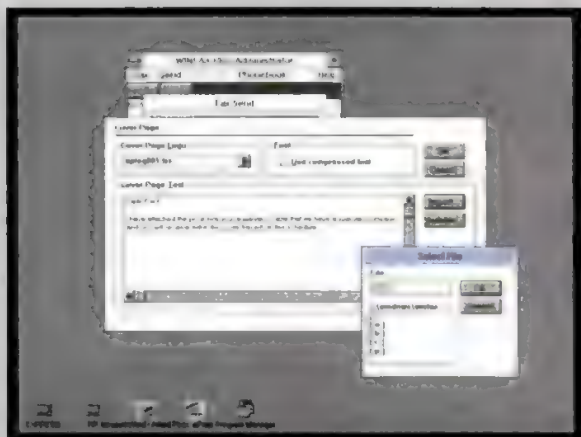
HANDS ON
by Alfred Poo

Delrina Technology's *WinFax PRO*, Version 2.0, is a major rewrite and improvement of the original *WinFax* launched in January of 1991. The original supported only fax modems with the Sierra Semiconductor Sendfax chip set. The new program expands support to include any Class 2 fax/data modem, as well as the Intel SatisFAXtion or other CAS-compatible modem.

For \$119 *WinFax PRO* adds timesaving features, including automatic cover sheets that can be created on the fly—you don't have to print them to disk and save them first. You can add your own logo or letterhead to the cover pages, add a message to the cover sheet, and embed system variables that will automatically enter information such as the recipient's name or the current date.

DDE links enable you to

look up fax numbers in other *Windows* applications. The program comes ready to recognize Polaris' *PackRat* (a *Windows* PIM application) so your *PackRat* file will appear in *WinFax PRO*'s list of phone books.



With *WinFax PRO*, you can create and send cover sheets on the fly, including custom messages or imported sections of text.

There is also a facility that lets you import phone book entries in ASCII text file format.

In addition to sending faxes, you can now receive them from any Group 3 fax device. *WinFax PRO* will store them on-disk and let you preview them with rotate and zoom features. You can also print, convert to .PCX or TIFF files, or resend a fax you've received.

Like its predecessor, *WinFax PRO* makes it painless to send faxes from your computer. The program installs as a "printer driver" in *Windows*,

and you initiate a transmission by selecting *WinFax PRO* as the printer. You can also store print jobs from various applications and then merge them into a single fax document.

WinFax PRO supports Intel's new network SatisFAXtion fax server for Novell's *NetWare*. The program has network-aware facilities built in, so you can access the fax server on the network simply by "printing" to the *WinFax PRO* driver within *Windows*.

WinFax PRO has garnered broad support from computer and modem vendors. AST Research, CompUSA, Laser Computer, Prometheus Products, PureData, and Zoom Telephonics have announced plans to bundle an OEM version of the program with their products.

Given Delrina's quick turn-out of this major revision, it seems that this is not a company to rest on past successes. *WinFax PRO* takes a giant step closer to making faxes and computers work together smoothly. ■

List Price: *WinFax PRO*, \$119.

Requires: *Windows 3.0*; Intel SatisFAXtion or CAS-compatible, Class 1 or 2 fax modem. Delrina Technology Inc., 6830 Via Del Oro #240, San Jose, CA 95119-1353; 800-268-6082, 408-363-2345.

CIRCLE 445 ON READER SERVICE CARD

Boyan 5.0 Communicates With Elegance and Ease, Helps End Modem Annoyances

HANDS ON
by Edward Mendelson

When *Boyan Communications* first appeared five years ago, it raised comm software to a new level of convenience and elegance. With Version 5.0 (\$60) just released, this shareware package brings even greater intelligence and sophistication to a software category noted more for technical prowess than for elegant design.

Boyan offers a unique interface ideal for experienced users and combines it with state-of-the-art programming. There's no menu for beginners, but F1 brings up help for all com-

mands. These commands follow the standard set by *ProComm* and similar programs.

Conveniences in the dial menu are typical of the thoughtfulness that went into the design. You don't have to enter separate commands before dialing manually or from the menu; the program recognizes a 1- to 3-digit number as a menu entry and a 7-digit number as a phone number.

Boyan's file transfers include batch protocols such as ZModem and CIS-B. The program also supports the new 16550A UART. *Boyan* can automatically detect the chosen protocol and start downloads in

two keystrokes.

Terminal emulations include IBM-3101, VT-100, TVI-925, and others; most have easily reprogrammable keyboards. You can integrate other emulations and protocols via external modules found on any BBS.

Boyan is rich in small touches that eliminate large frustrations. If you use an MNP modem that won't work with some remote systems when MNP is turned on, you can assign an alternate dialing string that turns MNP off when calling selected entries in your dialing directory. Logon scripts are smart enough to insert a replaceable parameter instead of your password for improved security. If a remote system displays a phone number on-screen, *Boyan Communications* can automatically copy it into the dialing directory.

Mouse support is built in.

A host mode module lets you use *Boyan* as a miniature BBS (complete with sysop menu) and a "doorway" module that acts as a remote-control program. Each module is built from *Boyan*'s script language, which has over 125 basic commands, and you can rewrite the modules to suit your needs.

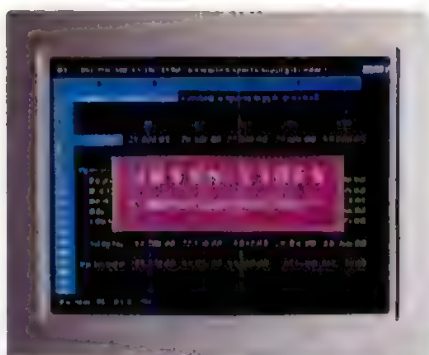
Boyan's drawback is its lack of phone support. Questions are answered only via a BBS. But *Boyan* is so reliable and trouble-free that you'll probably never need support at all. ■

List Price: *Boyan Communications*, Version 5.0, \$60. **Requires:** 256K RAM, DOS 2.0 or later. *Boyan Communications*, P.O. Box 71, Woodstock, MD 21163; 301-805-7168.

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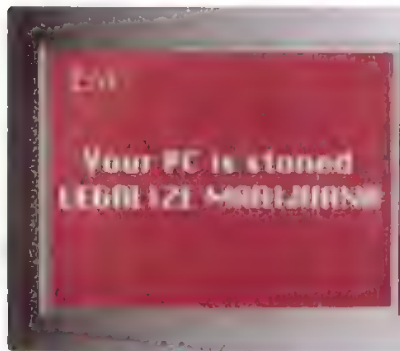
Ambulance Car Virus. Ambulance randomly moves across bottom of display.



Friday 13th Virus. Alias "Black Friday." Erases programs when you try to run them.



Disk Killer Virus. Alias "Ogre." Causes unexpected formatting of your hard disk.



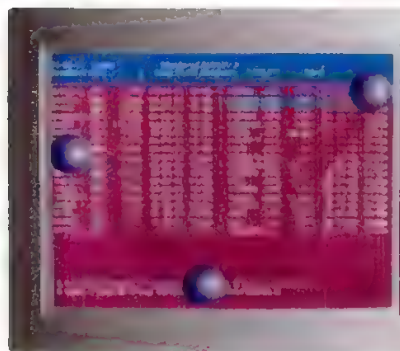
Stoned Virus. Alias "Hawaii." Data loss caused by damage to directory and FAT.



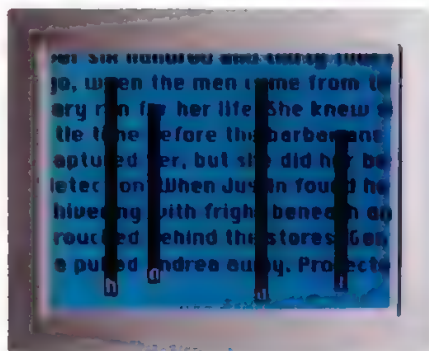
Datacrime Virus. Adds garbage to files and reformats disk.



AirCop Virus. Alias "Red State." Attacks boot sector on non-write-protected diskettes.



Ping Pong Virus. Alias "Bouncing Ball." Wipes characters off the screen.



Falling Letters Virus. Characters fall to the bottom of the monitor. Creative, but a real nuisance.



With over 50 new viruses each month, who knows what's next.

You Could Get By Without An Anti-Virus Program. Then Again, So Could These.

These days, with networks, modems, laptops, and more and more people sharing files, it's only a matter of time before a virus attacks your data.



To make sure you get them before they get you, you need Central Point Anti-Virus™. The only anti-virus program with File Immunization that protects your files so they can never be infected again. Central Point Anti-Virus detects over 800 viruses and destroys twice as many viruses as other programs. It'll even protect you from unknown viruses by searching for suspicious behavior.

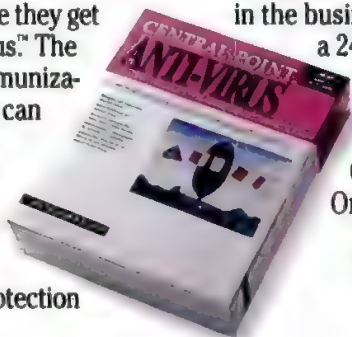
It's also the best anti-virus program for protection

inside Windows, and it works great across your Novell network.

And since there are about 50 new viruses popping up every month, we give you the most comprehensive support in the business. Including a free update, quarterly mailings, a 24-hour hotline with FaxBack, and BBS and CompuServe support forums.

If you want the most complete virus protection, there are really only two things you can do. Call 1-800-445-4076 for more information. Or unplug your computer.

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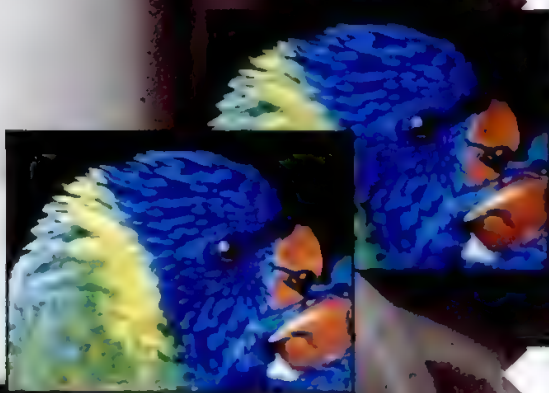
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Above right: Actual computer monitor image.
Above: Actual projection screen image from Ovation LCD projection panel.

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CIRCLE 501 ON READER SERVICE CARD

by
Nate Zelnick

New & Improved

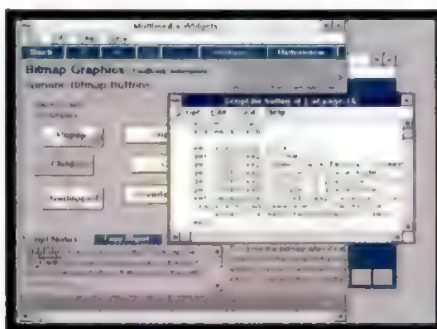
News of Announced Products and Upgrades

Multimedia ToolBook Eases Authoring for MM-Windows

IMPROVED The graphical application development features in Asymetrix's *Toolbook* have been enhanced to make it easier to develop multimedia applications. The *Toolbook MultiMedia Resource Kit (MMRK)* is an extension of *Toolbook* Version 1.5.

The resource kit provides over 250 "widgets" (predefined software construction blocks) that offer links and controls for multimedia hardware and software with DLLs that write to the *Microsoft Windows Multimedia Extensions* media control interface (MCI). Widgets can be cut and pasted into applications or altered using *ToolBook's* OpenScript.

Also provided are functions for displaying animation files from Autodesk's *Animator*, Gold Disk's *Animation Works*, or MacroMind's *Director*. Support for 256-color bitmaps and graphics filters for importing .DRW, EPS, TIFF, .BMP, .DIB, and *Windows* Metafile



The widgets in *Multimedia ToolBook* give you quick control over your multimedia *Windows* application.

graphics files is also included. **List Price:** *ToolBook Multimedia Resource Kit*, \$300. **Requires:** CD-ROM drive (to install *Microsoft Windows Multimedia Extensions*), *ToolBook* Version 1.5, *Microsoft Windows*, *Microsoft Windows Multimedia Extensions*. Asymetrix Corp., 110 10th Ave. NE, #717, Bellevue, WA 98006. 206-637-1500.

CIRCLE 431 ON READER SERVICE CARD

Sharp Introduces 24-Bit Color Scanner

NEW Sharp Electronics has introduced a 300-dot-per-inch 24-bit color scanner with a transparency option, allowing it to import 35-mm. slides. The JX-320 standard resolution can be increased up to 600 dpi with software interpolation.

The scanner offers either SCSI-2 or GPIB interfaces. When combined with Sharp's JX-730 or JX-735, the JX-320 becomes a color copier.

In addition to 24-bit color, the scanner also supports 256-shade gray-scale images. Sharp's bundled software allows control over threshold, brightness, and color gamma correction. **List Price:** JX-320, \$2,195; MCA version, \$2,295. **Requires:** Open slot for SCSI host adapter. Sharp Electronics Corp., Sharp Plaza, Mahwah, NJ 07430-2135; 800-237-4277, 201-529-9600.

CIRCLE 432 ON READER SERVICE CARD

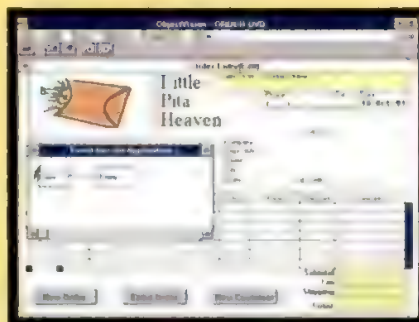
OBJECTVISION BROADENS DATABASE LINKS; STREAMLINES LOGIC TREES

NOT PROSPECT Borland has made major enhancements to the database linking abilities of *ObjectVision*, its form-based application development environment for *Windows*. Using "Locates" (similar to indexes), it can now perform quick search and retrievals of data based on automatic matching, restricted field searching or fuzzy logic, as well allowing the simultaneous display of all records that meet a search criteria. A new Event Tree function allows you to control your application's response to command functions, including the nesting of forms behind each other, to create more robust applications.

ObjectVision now supports unrestricted branching in its flowchart-style decision tree programming environment. This allows users to create boolean structures for their applications.

Other changes in Version 2.0 include the addition of a toolbar; OLE and enhanced DDE support; 92 new @ functions, as well as DLL support for custom functions; and new table objects and CUA control tools.

List Price: *ObjectVision*, Version 2.0, \$149.95; upgrades \$49.95. **Requires:** *Windows* 3.0. Borland International Inc., 1800 Green Hills Rd., P.O. Box 660001, Scotts Valley, CA 95066-0001; 800-331-0877, 408-438-8400.



ObjectVision 2.0 adds a Locate feature to speed through indexed databases.

CIRCLE 430 ON READER SERVICE CARD

CO/Session ACS: Low-Cost Shared Communication

IMPROVED Triton Technologies has announced a Novell *NetWare* and *NetBIOS* network version of its remote communications package, *CO/Session*, that offers an inexpensive way to share a modem on a network. *CO/Session ACS* (asynchronous communications server) allows workstations to share a single modem at speeds up to 38,400 bps.

The package consists of a nondedicated asynchronous communication server bundled with remote communication, file transfer and terminal emulation software. It supports any LAN-based communication package that uses the interrupt 14 interface, including *Crosstalk*, *Lexis*, *ProComm Plus LAN*, and *Relay Gold*.

CO/Session ACS can drive fast serial ports using the 16550 UART. It transfers data using either the XModem or its own communication protocol.

List Price: *CO/Session ACS*, Two modem package, \$295; four-modem package, \$590, 10 modems, \$1,295. **Requires:** 256K RAM, DOS 3.0 or higher, Novell *NetWare* or *NetBIOS* network. Triton Technologies Inc., 200 Middlesex Turnpike, Iselin, NJ 08830; 908-855-9440.

CIRCLE 433 ON READER SERVICE CARD

BRIEFS



PCS

Wang Laboratories has

released a line of seven PCs: four ISA machines ranging in processor power from 386SX/20 to 486SX/20 and three PS/2 clones. The ISA machines include the Wang PC 321/20S, 361/20S, 361/25SC, and 441/20SC. The 321/20S (\$1,410) is a 386SX/20-based diskless workstation with 1MB RAM (expandable to 16MB), two expansion slots, two 3.5-inch drive bays (one internal, one external), and a 1,024-by-768 resolution VGA adapter with 16 colors. The 361/20S (\$1,580) is identical except that it offers six expansion slots. The 361/25SC (\$2,095) is based on AMD's 386SX/25 with a 32K two-way associative cache. The 441/20SC is an upgradable system that comes with a 486SX/20 (\$3,425), an 8K four-way associative cache, four open slots, and 2MB RAM (expandable to 26MB). The three MCA PCs are second-sourced from IBM. The Model 57-045 (\$3,625), Model 90-OG (\$8,345), and Model 95-OKF (\$17,195) are Wang's models of IBM's PS/2 Models 57, 90, and 95. 508-459-5000.

Bell Computer Systems is now shipping a network server based on the 40-MHz AM386/40. The Bell Tower (\$4,999) comes with two Fast Technology SCSI controller cards, two duplexed 200MB hard disks, 8MB RAM (expandable to 64MB), a 256K write-back RAM cache, a 14-inch monochrome monitor, and two floppy disk drives. 800-922-1126, 818-909-3501.

Hyundai Electronics is now offering a line of upgradable PCs with a path from the AM386/40 (\$2,595 with one floppy disk drive and no hard disk) to systems based on Intel's 486/33DX chip (\$2,795 with one floppy and no hard disk). Called the Corporate Series, the ISA system uses processor modules for quick processor upgrades. The cache controller is auto-sensing and adjusts appropriately for each processor. Standard configuration includes: 4MB RAM (expandable to 64MB), 64K write-back cache (expandable to 256K), and VGA card. A number of hard disk options are available at additional cost. 408-473-9200.

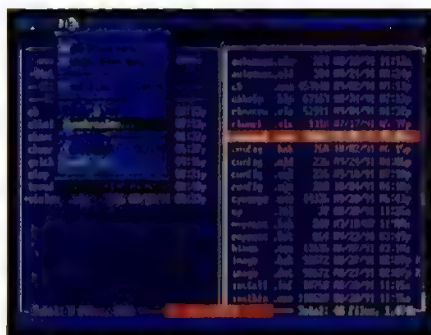
CONTINUES ON PAGE 64

LapLink Pro 4.0 Works With Direct or Modem Communications

IMPROVED The hardware-independent communication that **Traveling Software** incorporated into its *WinConnect* product has now been incorporated into *LapLink Pro*. This, combined with intelligent modem support, quick installation to a remote PC, improved cabling, and a new DOS-based CUA environment, significantly improves the product's ease of use, according to the company.

The universal communications object (UCO) allows *LapLink Pro* to create a communication link between PCs that is transparent to the user, regardless of how the PCs are connected. A proprietary data-compression scheme that shrinks files on the fly reduces transfer rates. The automatic remote install routine places *LapLink Pro* on the remote computer regardless of location.

The synchronize function of Version 4.0 allows users to reconcile differences between directories on both machines automatically. An added batch function automates repetitive tasks by recording and playing back mouse movements and keystrokes.



LapLink Pro 4.0 has a synchronizing routine that reconciles differences in directories on local and remote PCs.

List Price: *LapLink Pro*, Version 4.0, \$169.95; upgrades (including all versions bundled in other programs like *PC-Tools* 6.0 or 7.0), \$39.95; \$59.95 with cables and documentation. **Requires:** 440K RAM, DOS 2.11 or later, Hayes-compatible modem for modem transfers. **Traveling Software Inc.**, 18702 North Creek Pkwy., Bothell, WA 98011; 206-483-8088.

CIRCLE 434 ON READER SERVICE CARD

Word Processor Shares Files Across Platforms

IMPROVED **Microsystems Engineering** has released Version 2.0 of *WysiWord*, a WYSIWYG word processor that is file-compatible with versions running on Macintoshes, Sun Sparcstations, and Digital

Equipment Corp.'s VAXstations and DECstations.

The *Windows*-based system, which integrates drawing and graphing functions, has added support for the *Windows* Clipboard, DLLs and MDIs (multiple document interfaces). Other new features include spreadsheet functions in the table view, a print/preview mode, draft print mode, macros that incorporate boolean logic, and improved font support.

WysiWord converts files to and from *WordPerfect* and imports ASCII files.

List Price: *WysiWord*, Version 2.0, \$895.

Requires: *Microsoft Windows* 3.0.

Microsystems Engineering Corp., 2400 W. Hassel Rd. #400, Hoffman Estates, IL 60195; 708-882-0111.

CIRCLE 435 ON READER SERVICE CARD

386/SL Encrypts Data On the Fly

NEW **BCC**, a motherboard and graphics system OEM producer, has released the BCC SL007, a notebook based on Intel's low-power, static-mount 386/SL processor that incorporates the U.S. government standard DES encryption system in hardware.

The security system uses a 30-MHz 64-bit RISC-based encryption coprocessor developed by chip manufacturer VLSI Technology, which scrambles data to all storage and communications subsystems on the fly and without speed degradation, according to the company. Up to 99 security levels may be set for controlled communication between DES-equipped systems.

The 6.5-pound SL007 features a 20-MHz 386/SL, 4MB RAM (expandable to 8MB), a 60MB hard disk, a backlit 640-by-480 32-shade gray-scale VGA display subsystem, and a secure 2,400-/9,600-bps data/fax modem with MNP 5 compression, and V.42bis compression and error correction.

SAI Technologies will also be distributing the SL007. The company can be reached at 619-452-9150.

List Price: BCC SL007, \$4,995; DES option, \$995. **BCC**, 174 Component Dr., San Jose, CA 95131-1119; 408-944-9000.

CIRCLE 436 ON READER SERVICE CARD

Fujitsu Shrinks Wide-Carriage Dot Matrix Printer

NEW **Fujitsu** is now offering a radically redesigned 24-pin wide-carriage dot matrix printer, the Fujitsu DL1200, that occupies half the desk space of competitive models, according to the company. The 136-column printer is 7.7- by 20.7- by 9.8-inches (HWD), a size achieved by using a new upright design.

CONTINUES ON PAGE 64

Introducing Borland's Unified Solution for Paradox, dBASE and InterBase

The future of dBASE

Simply stated, we're committed to revitalizing dBASE®: delivering more power, more flexibility and better support to the whole community of dBASE users. We are using our object-oriented development techniques to accelerate releases and add substantial new features. We're adding new SQL server links, event handling and object-oriented extensions to the dBASE language.

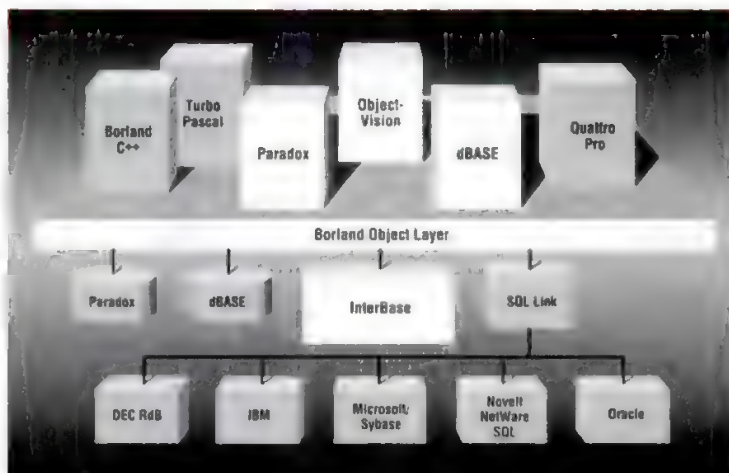
Soon, as quickly as 1992, you'll see a new dBASE for Windows and DOS, as well as compilers that generate fast, tight code. All based on Borland's proven technologies, all compatible with the existing dBASE standard. That's the Borland commitment to the dBASE community!

The future of Paradox

Paradox® is entering the world of objects. We're evolving PAL™ and all the Paradox interactive design tools. Using our leading edge object-oriented technology, you'll be able to visually create sophisticated Windows applications. Instantly. We'll also be introducing revolutionary database-publishing tools as well as powerful new data-modeling capabilities. More than ever, Paradox gives you instant database power on Windows or DOS.

InterBase, the database server of the '90s

InterBase™ is the first relational database server to satisfy the demands of online complex processing. The kind of real-world applications used in finance, banking and manufacturing. Designed for optimal performance in multi-platform networks, InterBase provides features targeted at the needs of highly complex database applications in dynamic, distributed environments. InterBase is the clear technology leader with advances such as true peer-to-peer architecture, highly efficient event alerters, "smart" automatic two-phase commit and rollback,



Borland's object-oriented architecture will allow Windows versions of Paradox, dBASE and Quattro® Pro to work together in enterprise-wide information systems, giving you instant access to more types of data.

Borland, leader in customer satisfaction

J.D. Power and Associates just ranked Borland "Best application software in customer satisfaction in Small to Medium-sized Businesses."™ Company for company, technology for technology, Borland is your best choice.

Borland, your database partner for the '90s

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"By bringing two database platforms under one strong management and support organization, Borland is providing a unified solution to our current database needs."

— Carl Hane, Group Leader
Micro Applications Systems
MCI International, Inc.

"Now we know that dBASE will have a bright future in Borland's hands."

— Adam Green

multi-threaded servers and instant recovery from hardware failures. For Paradox and dBASE network users, InterBase will work wonders in helping integrate your data from the desktop to the mainframe. All with unprecedented simplicity.

Borland, the technology leader

Borland is the pioneer of object-oriented technology. We're now at the forefront of 32-bit computing. What this all means to you: more power, more performance and lower support costs. And that's why IBM and Novell have picked Borland as a strategic partner.



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And, to inaugurate the new era of dBASE from Borland we're making this special, limited-time offer. Purchase dBASE from any dealer between October 14, 1991, and January 31, 1992, and get a \$100 manufacturer's rebate.

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CIRCLE 287 ON READER SERVICE CARD

New & Improved

BRIEFS

CONTINUED FROM PAGE 62

Falco Data Products has shipped a small-footprint 40-MHz, 486-based graphics workstation. The GT486/40 (\$2,909) achieves the higher processor clock speed through a cooling system using two thermostatic fans. The standard configuration stuffs 1MB RAM (expandable to 32MB), a 105MB SCSI hard disk, a 2.88MB 3.5-inch floppy disk drive, and a VGA card with 1,024-by-768 resolution and 32,000 colors into a 2.7-inch-high case. 408-745-7123.

Arche Technologies is shipping two 25-MHz 486SX-based PCs that it claims achieve speeds of 21 mips. The systems use Arche's ASIC system logic chip sets, which include a custom memory, datapath, and cache controllers. The Arche Legacy 486SX-25 features keyboard-selectable clock speeds of 8 or 25 MHz, a CPU upgrade socket, 4MB of RAM (expandable to 32MB), an IDE disk controller, and Arche's ProCache flagged copy-back cache architecture. The Arche Master 486SX-25 adds a caching disk controller with 512K (expandable to 16MB) and Arche's 486 intelligent cache architecture to the Arch Legacy design. 800-437-1688, 510-623-8100.

Hertz Computer Corp. has announced the availability of its 486/33-based EISA PCs. The server, designated as the 486/EI-T (\$8,320), is a tower that comes with a 380MB SCSI hard disk with a claimed access time below 4 ms. achieved by using a cached disk controller. The system offers ten 32-bit expansion slots and 8MB RAM (expandable to 64MB). The 486/33EI-DT (\$7,895) is a desktop unit with eight 32-bit expansion slots. 212-684-3658.

Unisys has announced an addition to its PW² Advantage line of PCs based on the Intel 386 CPU family and aimed at the network node market. The machines come in 386SX/20, 386DX/25, and 386DX/33 configurations. The 386SX/20-based 3206 (\$2,395) offers 2MB RAM (expandable to 32MB), one 1.44MB 3.5-inch floppy-drive, a super VGA controller, and SCSI II hard disk controller. The 386DX/25-based 3256 (\$3,595) and 386DX/33-based 3336 offers 4MB RAM (expandable to 64MB).

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Fujitsu has rated the print speed at 240 characters per second in 12-character-per-inch draft mode. The printer comes standard with nine fonts, sheet-feeder paper handling, and *DLMenu* software for emulation switching from the PC. The DL1200 offers Epson LQ-2550 and IBM XL24 emulations as standard. Options include a single bin sheet-feeder, serial interface, and a color upgrade kit.



The upright design of Fujitsu's DL1200 lets the wide-carriage printer occupy less desk space.

List Price: DL1200, \$649; color option, \$60; single bin sheet-feeder, \$226; RS232 interface board, \$74. **Requires:** Parallel or serial port. Fujitsu America Inc., 3055 Orchard Dr., San Jose, CA 95134; 800-626-4686, 408-432-1300.

CIRCLE 437 ON READER SERVICE CARD

3.5 Oz. Class Fax/Modem Has Epson Emulation

NEW **Solectek's** Pocket Fax Modem, which the company claims is the first to use the Class 1 Rockwell chip set, offers an embedded Epson printer emulation to better match output with the screen. The modem is an MNP 5 device that includes a 9600-/4800-bps send/receive fax and 2400-bps data modem squeezed into a 1.25- by 2.75- by 5-inch, 3.5-ounce package.

The included 79K TSR allows the modem to send faxes from any DOS application. Scheduled background faxing and automatic receiving are also supported. A separate *Windows* package with drivers and software is available.

This modem can be powered by an internal battery or external power adapter. A sleep mode feature saves power when the modem is not in use. The power adapter, RJ11 cable, and 2-foot DB9 serial cable are included.

List Price: Solectek FM-D (DOS), \$299.95; FM-W (*Windows*), \$349.95. **Requires:** Serial port. Solectek Corp., 6370 Nancy Ridge Dr. #109, San Diego, CA 92121-3212; 619-450-1220; 800-437-1518.

CIRCLE 438 ON READER SERVICE CARD

Boca Board Gives High-Color at Low Price

NEW **Boca Research** has released a VGA board using the Tseng ET 4000 chip set and Sierra's SC11486 RAMDAC with 1MB of video RAM for \$295. The BOCA SuperX VGA card features both interlaced and noninterlaced modes of 800-by-600 and 640-by-480 resolutions at a refresh rate of 72 Hz.

The Sierra RAMDAC allows simultaneous display of up to 32,768 colors. The card is backward-compatible with 256- and 16-color display in resolutions up to 1,024 by 768.

Bundled high-color drivers include *Windows*, *GEM*, *Ventura Publisher*, *AutoCAD*, and 132-column text display.

List Price: BOCA SuperX VGA, \$295.

Requires: Open ISA or EISA slot. Boca Research Inc., 6401 Congress Ave., Boca Raton, FL 33487-2841; 407-997-6227.

CIRCLE 439 ON READER SERVICE CARD

9600-bps Hayes-Compatible Modem For \$299

NEW **Lightning Communications** has lowered the cost of high-speed communications by offering a fully loaded 9600-bps internal modem for \$299.

The half-card device uses Rockwell's V.32 data pump, ensuring compatibility with a majority of high-speed modems. V.42bis error correction and data compression are used, as well as the MNP 5 data compression standards. With these standards enabled, and when communicating with similarly equipped modems, effective throughput is increased to 38,400 bps.

The LightCom96 uses the Hayes AT command set, including extensions for MNP and V.42 operation. *Quick Link II* communication software is included.

List Price: LightCom96, \$299. **Requires:** Open slot. Lightning Communications, 36 Argonaut, #150, Aliso Viejo, CA 92656; 714-457-8001.

CIRCLE 440 ON READER SERVICE CARD

Writer's Toolkit Comes To Windows, Adds Cultural Dictionary

NEW **The Writer's Toolkit**, an integrated package of writing aids from **System Compatibility Corp.**, is now available for *Windows*. The package, which features writing reference tools including *Roger's II Thesaurus* and Houghton Mifflin's *CorrecText* grammar-, style-, punctuation- and spell-checker, has added a dictionary of common knowledge, based on *The Dictionary of Cultural Literacy*.

CONTINUES ON PAGE 66

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Right now, until January 31, 1992, if you buy Borland's Quattro[®] Pro 3.0[™] or Paradox[®] 3.5[™], you'll get *two more great products* absolutely free! (Up to \$229 retail value!) Choose any two of the following products:

Borland's Sidekick[®] 2.0 (\$99⁹⁵), the world's best PC organizer; Quarterdeck's QEMM-386[™] v6 (\$99⁹⁵), the best-selling memory manager; or Central Point Software's Central Point Backup[™] 7.1 for Windows[™] and DOS (\$129), winner of PC World's World-Class Award.

Buy Quattro Pro, the winner of 40 awards of excellence. With over one million users, it has all the features you're looking for in a high-end spreadsheet: powerful number crunching with advanced linking and consolidation, a fully integrated WYSIWYG display and Print-To-Fit[™] that proportionally reduces your spreadsheet to fit on a single page.

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upgrade for DOS or Windows for \$49⁹⁵; your Paradox 3.5 purchase entitles you to your next Paradox upgrade for DOS or Windows for \$139⁹⁵. These special upgrade prices are good until March 31, 1992.

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Q3C-PCM 12/91

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Software Craftsmanship

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CIRCLE 295 ON READER SERVICE CARD

New & Improved

BRIEFS

CONTINUED FROM PAGE 64

and a 16K cache. All systems come with MS-DOS 5.0 and Windows 3.0. All systems offers six free 16-bit expansion slots. Hard disks are available at additional cost. 215-986-4011.

AST has added a 386DX/25-based machine to its Premium II line of upgradable PCs. The 386/25 (\$2,195) conforms to AST's CUPID-32 (completely universal processor, I/O design) architecture. The basic system consists of a 16K four-way associative cache, 2MB RAM (upgradable to 16MB), 3.5-inch 1.44MB floppy disk drive, and a Super VGA controller. An 80MB IDE hard disk is available for an additional \$500. 714-727-4141.



LAPTOPS

Micro Express has announced a 386DX/33-based notebook. The NB3300 (\$2,695) offers a 40MB hard drive, 2MB RAM, 1.44MB 3.5-inch floppy disk drive and a 32K cache squeezed into a 9 pound 2-by 11-by 8.6-inch (HWD) package. The NB3300 has one serial, one parallel, external floppy, VGA out, expansion bus, and external keyboard connectors. The unit has a 9-inch diagonal 32-shade backlit VGA LCD screen. Micro Express rates battery life at 2 hours. 800-989-9900, 714-852-1400.

Hertz has announced the availability of a 7-pound notebook. The Hertz 386/SX notebook (\$2,195) comes with 1MB of RAM, a 25 ms. 20MB hard disk, a 3.5-inch hard disk and a 9-inch backlit VGA that displays 32 shades of gray. Battery life is rated by the company at 2 hours. 212-684-3658.

Micronics is now offering a 14.9 pound AC-only laptop that uses Intel's 486/33 processor and has an integrated projection panel option. The Mport 433 (\$5,995) comes in a clamshell configuration and offers 4MB RAM (expandable to 32MB), a 16-bit expansion slot, and a 120MB hard disk. A 210MB hard disk is also available. The Mport offers the Mpression option, which consists of a 3-pound color or gray-scale LCD projection panel that attaches to the unit with one cable. 510-651-2300.

CONTINUED FROM PAGE 64

The program supports all major Windows word processors and is available as a menu add-in from *Microsoft Word for Windows*, *WordPerfect for Windows*, and *Ami Pro*. A drag and drop option allows you to drop a file's icon on *The Writer's Toolkit* icon to begin grammar- and spell-checking. Any text in unsupported programs may be checked by cutting it to the Clipboard.

The Dictionary of Common Knowledge contains over 20 categories of general information, including geography, literature, philosophy, and science. It offers a reverse-search feature that allows you to find specific entries by searching through related topics.

List Price: *The Writer's Toolkit*, \$129.

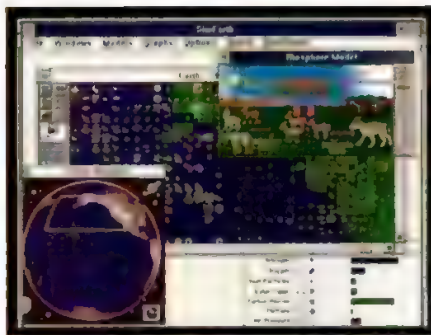
Requires: Windows 3.0. Systems Compatibility Corp., 401 N. Wabash, # 600, Chicago, IL 60611; 312-329-0700.

CIRCLE 441 ON READER SERVICE CARD

SimEarth Windows: Run the World in The Background

IMPROVED Maxis's earth-shattering building and management software toy, *SimEarth*, now offers world power from Windows. The move brings higher resolution graphics to the game as well as allowing it to offload overhead to the Windows environment and use multithreading to run in the background. 3-D buttons and support for the Windows help system have also been added. Copy protection has been eliminated.

SimEarth, which has won several awards since its release, is based on the Gaia Theory



Now you can run the world without losing productivity—*SimEarth Windows* runs in the background.

concerning the interrelationship of all planetary systems, including geological, chemical, and cultural systems. Players attempt to develop planets by controlling aspects of these and other systems.

List Price: *SimEarth for Windows*, \$69.95; upgrade, \$19.95. **Requires:** Windows 3.0. Maxis, 2 Theatre Square, #230, Orinda, CA 94563-3041; 501-254-9700.

CIRCLE 442 ON READER SERVICE CARD

Pixie 2.3 Adds SuperPrint, Speeds Up Windows Performance

IMPROVED Zenographics has just started bundling its Windows font optimization utility, *SuperPrint*, to its presentation graphics package, *Pixie*. *Pixie 2.3* has also significantly increased the speed of its initialization, screen font generation, screen refresh, and graphic file import functions, according to the company.

The package now offers an icon-based toolbox and customization features. The toolbox offers functions for aligning, grouping and ungrouping objects. Users can now adjust bar widths, arrowheads, charts and drop shadows on the fly. Also added to the package is support for 24-bit continuous-tone DIB (device independent bitmap) files. Output of these files has been optimized to take best advantage of your printer.

The package includes a 450 file clip-art library.

List Price: *Pixie*, Version 2.3, \$295; upgrades \$75. **Requires:** Windows 3.0. Zenographics, 4 Executive Circle, #200, Irvine, CA 92714. 714-851-6352.

CIRCLE 448 ON READER SERVICE CARD

PC Includes Windows Graphics Coprocessor On Video Adapter

IMPROVED Tangent Computer is now offering the S3 Carrera graphics accelerator chip on the VGA card of its AM386/40-based PC, according to the company. The graphics chip incorporates VGA compatibility, as well as functions of the IBM 8514 chip set, including its bit block transfer (btlbt) and line drawing features (First Looks, November 26, 1991, page 50). Increased btlbt rates can significantly enhance Windows performance.

Tangent has bundled its own drivers for the S3 with the system. Windows drivers are supplied for all VGA resolutions, up to 1,280 by 1,024 by 16 colors. A true color mode of 1,024 by 768 by 256 colors is also available. Tangent's video adapter has an open slot that can accept the Sierra HiColor RAMDAC, allowing it to display up to 32,768 simultaneous colors.

The Tangent Model 340 is built around AMD's 40MHz AM386. Standard configuration includes 4MB RAM, 120MB hard disk, 1MB video RAM, 2 floppy disk drives (one 1.2MB and one 1.44MB), a 72-Hz non-interlaced super VGA monitor, and Microsoft's DOS Version 5.0.

List Price: Tangent Model 340, \$2995. Tangent Computer Inc., 197 Airport Blvd., Burlingame, CA 94010; 415-342-9388.

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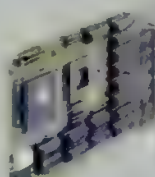
FALCON 486/33



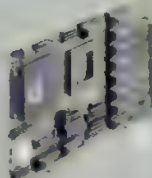
FALCON 386/33



FALCON 486/25

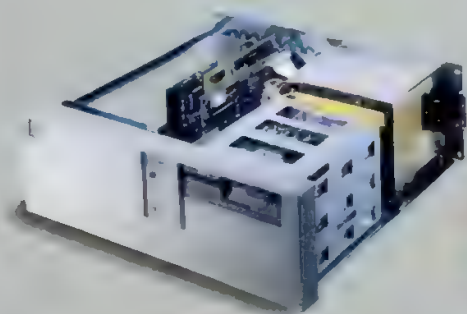


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edited by
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Read Only

Reviews of the Latest Books for the PC User

Comprehensive "How-to" Manual Leads The Way to Object-Oriented Programming



As users demand more powerful software, developers are finding that traditional software design and production methods are no

longer practical. Software developers now look to object-oriented design in order to better manage increased program complexity and extend the software life cycle. But so far the move to object-oriented programming has been disjointed because of the lack of standards for the vocabulary, syntax, and processes that make up the object architecture. *Object-Oriented Design with Applications*, by Grady Booch, breaks new ground in setting forth a discipline for effectively applying the elements of the object model.

Booch provides a fundamental explanation and example of the object model for a wide audience of software engineers, analysts, system architects, project managers, and students. "Concepts," the first of three major sections, establishes terms and definitions while answering such questions as "What is a class?" and "What is an object?" It also describes the steps needed to identify and classify objects and behavior as well as how to fit them into a system model.

The next section, "The Method," defines the agent for developing complex systems, including a sensible graphic notation for documenting the process. Here, Booch describes object-oriented design as a process that is neither top-down nor bottom-up, but rather "an incremental and iterative round-trip"—

dramatically different from most traditional development projects with linear software life cycles. Booch ends the section with the most important discussion in the book, examining from a manager's perspective the practicalities of migrating to an object-oriented architecture as well as providing valuable information on staffing resources, organizational risk, and transitional costs.

"Applications," the book's

last section, contains five case studies of the complete object-oriented process. A different programming language (Smalltalk, Object Pascal, C++, LISP, and Ada) is used in each example to show how a language can impact the process. Booch also covers a variety of problems in such areas as process control, scientific calculations, artificial intelligence, management information systems, and network management.

The book's only serious flaw is its tone; too often it reads like a textbook. Booch treads on new

territory, however, with this comprehensive object-oriented "how-to" manual—complete with real-life illustrations and diagrams. It's an essential part of any software professional's library.

—Bob Airasian

Object-Oriented Design with Applications

by Grady Booch, \$43.25, The Benjamin/Cummings Publishing Co. Inc., 390 Bridge Parkway, Redwood City, CA 94065; 800-447-2226. ISBN: 0-8053-0091-0.

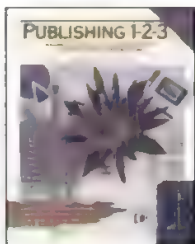
CIRCLE 406 ON READER SERVICE CARD

Spreadsheet Publishing and Presentations: Two Books for Designing Spreadsheets Using 1-2-3 or Quattro Pro

If you're looking for a no-nonsense approach to the rigors of spreadsheet publishing with *Lotus 1-2-3*, Mary Campbell's *Publishing 1-2-3* will give you an engaging mix of design objectives and 1-2-3 command sequences that you can put to work.

Campbell begins with a discussion of important basics such as hardware considerations and 1-2-3's output options. She outlines ten design objectives including readability, organization, and presentation consistency and method as well as audience considerations. Especially helpful is the side-by-side placement of effective and ineffective 1-2-3-generated graphs, tables, and charts, with a discussion of their respective merits and failings.

Campbell uses examples of boxes, shading, and type to illustrate principles of effective page design. In her section on printers Campbell concisely describes basic font technologies, focusing on how to send control codes to HP-compatible printers through



1-2-3. She gives short shrift to other output options such as plotters and film recorders—although in all fairness, the emphasis is on printed output.

The chapter on improving output using 1-2-3 features exam-

ines the differences among and enhancements offered by the various 1-2-3 releases. Useful sidebars show the steps necessary for constructing models, changing formats, adding titles and labels for graphs, and creating two- and three-way data tables. She also discusses the use of macros to ease repetitive tasks, and covers Versions 2.2's and Version 2.3's macro recorders.

WYSIWYG and *Allways*, the 1-2-3 spreadsheet publishing add-ins, are also explored in dedicated chapters. The author provides clear instructions for creating complex output, including how to place graphical objects in your worksheets. These chapters include eight pages of high quality, four-color art examples of on-screen spreadsheet

charts, graphs, and tables.

Campbell also focuses on external programs you can use to enhance your published spreadsheets, on integrating your spreadsheet data into word processors (*WordPerfect 5.1* is the application used in the book), and linking your spreadsheet data with adjunct graphics programs (*CorelDRAW*, *DrawPerfect*, *Harvard Graphics*, and *Lotus Freelance*, all accompanied by excellent illustrations). There's also a vendor reference for products used in the book, and appendices that list the LICS and LMBCS codes used to provide access to special characters in 1-2-3.

This thorough book will help anybody who needs to publish 1-2-3 spreadsheets by combining design concepts with concrete 1-2-3 techniques. It's a superior primer on add-ins and related graphics programs, and may well prove indispensable to those who are ready to move beyond those green-and-white-lined perforated forms.—Tom Unger

Publishing 1-2-3

by Mary Campbell, \$24.95, M & T Books, 501 Galveston Dr., Redwood City, CA 94063; 800-533-4372, 415-366-3600. ISBN 1-55851-199-7.

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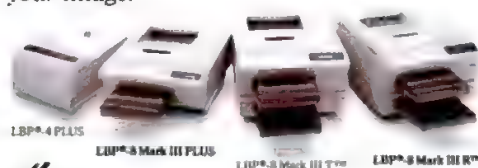
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Read Only



Christopher Van Buren's *Spreadsheet Publishing with Quattro Pro* lifts a good deal of the mist off of this foggy topic. While this

300-page handbook provides numerous how-to examples, it is limited by its own goals. As an aid to creating snazzy spreadsheets with Borland's *Quattro Pro*, it's excellent. For guidance in document and presentation design, it's more gloss than help. It teaches you how to use *QP*'s graphics features, not how to design.

The introductory chapter frames the book's principal problem: The book, neither solely for

beginners nor experts, is filled with techniques that will help both. This forces Van Buren to condescend to his expert audience—"A slide is generally part of a slide show," while confusing his novice readers with checklist questions such as "Are you using good page composition, including effective use of white space?"

Following a fine section on how *Quattro Pro* uses color in its Graphics and WYSIWYG modes, Van Buren leads novice and intermediate *Quattro Pro* users through detailed discussions of the finer points of spreadsheet formatting, printers, fonts, and typefaces. He also includes a chapter on *Quattro Pro*'s Annotator, the graph and table editor.

The second section, entitled "Putting It All Together," will appeal to more experienced users. Here, Van Buren aims at those with true design concerns,

giving some strong examples of *Quattro Pro*-generated financial reports mixed with a variety of graphical objects. A solid chapter covers printing options in depth, including page formatting and methods for making various printers work with the documents you design. Van Buren also examines ways of designing slide shows (including using a service bureau), screen shows, and overhead transparencies. Van Buren's discussion of color in presentations works especially well; it is accompanied by eight pages of four-color art.

A third section, "Design in Action," provides a breezy set of design "do's" and "don'ts," but it stumbles in attempting to deal with novices and advanced users at the same time.

Throughout the book, helpful sidebars provide step-by-step instructions to the tasks described by the main text. A useful chap-

ter entitled "Resources" includes books devoted to (and better suited to) instruction in design. Ventana Press also offers a companion disk with templates, macros, art, and a font downloading tool that costs another \$39.95—a steep price to pay, especially when many publishers include disks with their books.

Novice and advanced users of *Quattro Pro* will find plenty of advice to sink their teeth into with the book's many examples and straightforward style, but in glossing over the finer points of design, *Spreadsheet Publishing with Quattro Pro* may confuse beginners and bore the experts.

—Tom Unger

Spreadsheet Publishing with Quattro Pro

by Christopher Van Buren, \$21.95, Ventana Press, P.O. Box 2468, Chapel Hill, NC 27515; 919-942-0220. ISBN: 0-940087-64-2.

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Trudy Neuhaus

Toolkits

Reviews of the Latest Tools for the PC Programmer

Zinc Delivers a Robust Interface Library For Windows Application Development

The Zinc Interface Library (ZIL), Version 2.0, is a significant upgrade of 1.01, which remains one of the finest C++ class libraries available for interface design. With this release, Zinc Software adds support for *Windows* application development to its support for DOS character and graphics modes. It features Zinc Designer, a screen designer for visually and interactively creating user interfaces, and it has given its objects *persistence*. An object that just exists in memory for the duration of a given program or subroutine is said to be transient. If an object is stored on-disk in such a way that it exists outside of any program, it is persistent. Because Zinc interface objects such as icons and buttons are persistent, they can be conveniently stored on-disk.

Zinc Software consistently delivers on the promise of OOP. Its class libraries shield the developer from many of the intricate details of GUI programming. For example, Zinc manages details such as which video adapter (VGA and so on) and which target video mode (DOS graphics or text modes, or *Windows*) is being used. It does this by using a display class (an abstract class) called `UI_DISPLAY` to define the general features needed for screen output. Four classes are derived from `UI_DISPLAY`, and each class handles one of four modes: Borland graphics, Zortech graphics, *Microsoft Windows*, or text. So instead of writing code to handle the low-level details of the video interface, programmers can focus on high-level issues such as user interface design.

To connect ZIL to your pro-



gram or application, you need to write or call the code that activates the screen you build in the screen designer. You have to build an event manager and then add the necessary devices, build a window manager and add win-

dows. In keeping with the nature of object-oriented programming, on-screen windows are built by creating an instance of a window object. Once you have done all this, you can just let Zinc, like any other *Windows* program, manage the events. The event loop cycles patiently, waiting for something to happen. When an event occurs, the event manager interprets it and sends the interpreted information to the window manager via the event queue, which passes the information to the appropriate window, which acts accordingly.

We compiled a simple Hello program to compare the size and speed of a ZIL program in its different modes, and to compare it with a few other simple programs. As you would expect, the size of the .EXE files increased as the target environment became more complicated. The Zinc Hello programs were about 100K in text mode, 124K in graphics mode, and 130K for *Windows*. The *Windows* Hello program that comes with Borland C++ compiles to only 16K, but a similar Blaise Win++ (another *Windows* class library) Hello program compiles to 150K.

Although these program sizes may seem huge, they're really quite acceptable. The first window object your program uses will increase the size of your program disproportionately, because it pulls in all code related

to window objects. However, subsequent window objects of the same or a similar kind will hardly increase your program's size since much of the code they need is already in your program. In addition, we found no execution degradation resulting from an increase in size.

The Zinc Interface Library is a robust set of tools, yet it's not quite the perfect world that Zinc portrays in its ads. While ZIL can teach you object-oriented design, there's no way to avoid learning *Windows* programming if you want to build *Windows* applications. It is true that you no longer need the *Windows* SDK (you can thank Borland for that). But, you can't expect to do serious *Windows* development without the *Windows* reference manuals (available from Microsoft Press) and a definite commitment to this course of study.

As an example, the ZIL virtual function `UI_WINDOWS_DISPLAY::Text` draws text on the screen using the *Windows* function `TextOut()`. Unless you have some reference that describes the way `TextOut()` works, using the ZIL interface to do it is an exercise in iterative trial-and-error programming. Further, the Zinc documentation states "This function uses the *Microsoft Windows* `TextOut()` function with the following modifications:" whereupon it lists three important differences between ZIL's function and `TextOut()`. Clearly, you are expected to know how `TextOut()` works; otherwise the directions in the use of the ZIL *Windows* display function make no sense.

Version 2.0's documentation has been redesigned and significantly expanded. Unfortunately, it makes a lot of assumptions about what a programmer knows, burying simple details in hard-to-find places.

For example, we had trouble

finding a succinct description of what code changes needed to be made to a program—even a sample program—so it would compile as a *Windows* application. Since this feature is advertised heavily, you would think this information would be emblazoned on the manuals.

We recommend ZIL highly, with some qualifications. The manuals are good, better than in any previous release, but there's still room for improvement in their indexing and organizational schemes. Second, Zinc takes a nontraditional approach to window objects. There are no resources and no resource files. Instead, in order to maintain compatibility across all three platforms, Zinc uses persistent objects. Third, you must use the large memory model when you compile *Windows* programs with ZIL. Some *Windows*' developers may consider the large model an unacceptable limitation, but it is a *Windows* limitation having to do with the way DLLs handle memory, and one that class library support is likely to require for the foreseeable future.

Zinc can teach you object-oriented programming and GUI design. It cannot teach you *Windows* programming. However, when it comes to class libraries, the Zinc Interface Library is as good as it gets, which is very, very good.—Rick and Sue Ayre

Zinc Interface Library, Version 2.0.

List Price: \$299.95; with source code, \$399.95. **Requires:** For DOS programs: 640K RAM, DOS 2.1 or later, and Turbo C++ or Zortech C++ 3.0. For *Windows* programs: 640K RAM, DOS 2.1 or later, *Windows* 3.0, and Borland C++ or Zortech C++ 3.0. Zinc Software Inc., 405 S. 100 East, Pleasant Grove, UT 84062; 801-785-8900.

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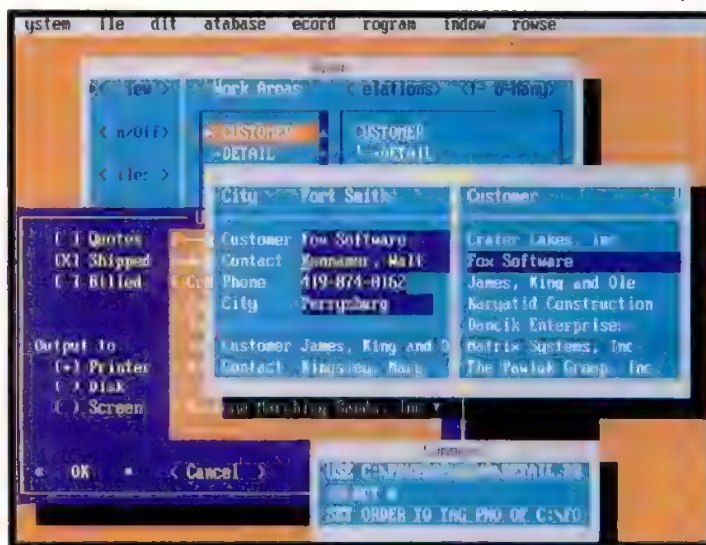
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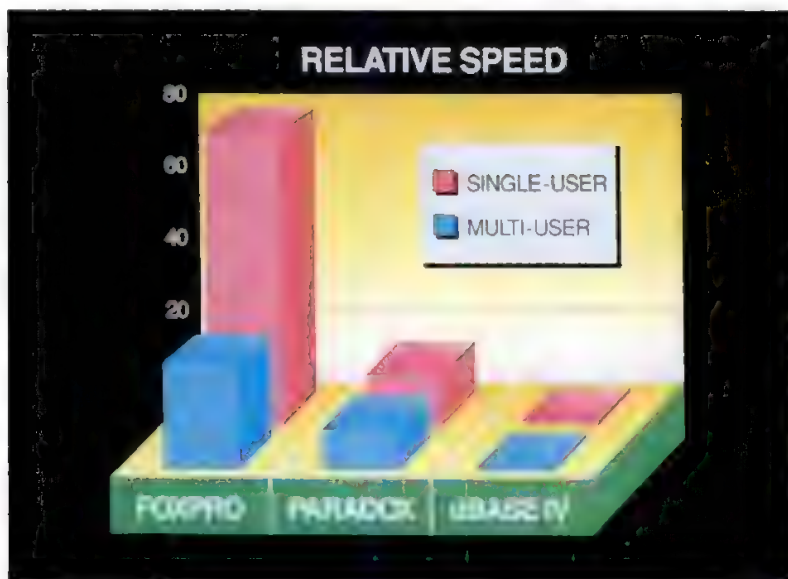
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Multimedia: Seeing is Believing

As products come to market we'll learn to use multimedia without worrying about its definition.

Multimedia this. Multimedia that. In an industry obsessed with buzzwords, "multimedia" is the hottest and vaguest buzzword yet, although "object-oriented" is gaining fast.

I've seen documents with embedded graphics called "multimedia documents." I've seen slide shows with text and numbers called "multimedia presentations." I've seen databases with picture fields called "multimedia information." It's enough to make you wonder whether multimedia means anything at all.

Perhaps it is all sound and fury, signifying nothing.

But wait, is that quote right? Let me check

it by looking it up in *Microsoft Bookshelf for Windows*. That's one of the first CD-ROM packages to support the new Multimedia PC specification. The multimedia *Bookshelf* holds seven research books: a '91 world almanac, an atlas, a dictionary, Bartlett's *Famil-*

iar Quotations, a thesaurus, and Columbia's concise encyclopedia and dictionary of quotations. I'm trying it out on the new Tandy 4033LX Multimedia, one of the first PCs to support the MPC spec.

My *Bookshelf* journey begins as I search all of these books for the phrase "sound and fury." My search turns up nine entries. First, I check out the quote from *The Concise Columbia Dictionary of Quotations*:

It is a tale

Told by an idiot, full of sound and fury;

Signifying nothing.

The listing tells me that the quote is about life. The words were written by William Shakespeare, the English dramatist and poet (1564–1616), and spoken by Macbeth in Shakespeare's play of the same name. That's a good start, but I want more. In Bartlett's *Familiar*

Quotations, I find a longer version:

Life's but a walking shadow, a poor player

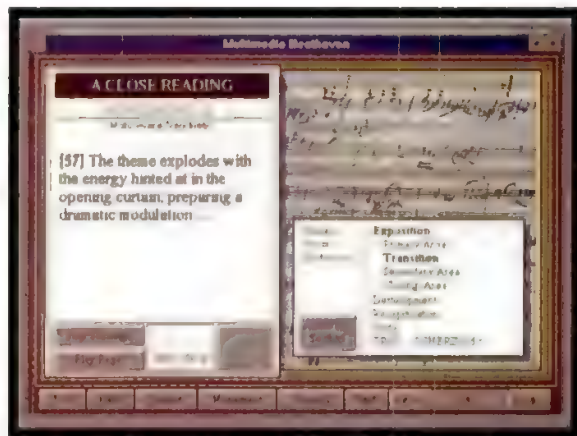
That struts and frets his hour upon the stage,

*And then is heard no more; it is a tale
Told by an idiot, full of sound and fury,
Signifying nothing.*

Bartlett's even tells me the act, scene, and line of the play. (That's *Macbeth*, act V, scene v, line 17, for you Shakespeare buffs.) Further searching would lead me to other references, such as *The Concise Columbia Encyclopedia*'s biography of William Faulkner, author of the 1929 novel, *The Sound and the Fury*, or various quotes in Bartlett's from that novel.

So far, there's been nothing particularly multimedia about the process. You could do much the same thing in the DOS-based CD-ROM version of *Microsoft Bookshelf*.

But suppose the quote peaked my interest. I could follow up on Shakespeare and find thousands of references, including many quotes and his biography. The encyclopedia tells me he was born in Stratford-upon-Avon. I could search for that and find three entries, including his biography, an encyclopedia entry on the town, and an *American Heritage Dictionary* reference that includes the pronunciation of the word when you click on the sound icon. Microsoft has had a single voice (backed with a linguist's coaching) correctly pronounce each



Multimedia Beethoven walks the listener through the Ninth Symphony, describing the action as you hear it.

of the more than 50,000 words in the dictionary. At last, some multimedia.

Bookshelf has a variety of facets that really are multimedia. In addition to spoken pronunciations in the dictionary, the encyclopedia has 27 animations that show how various things

Michael J. Miller

work. They range from erupting volcanoes and cell mitosis to an impressive animation of how the human ear works—complete with an excellent vocal annotation. Microsoft also sprinkles some recorded voices into *The Concise Columbia Dictionary of Quotations*; you can

actually hear e. e. cummings, John F. Kennedy, and Dylan Thomas speak their own words. *The Hammond Atlas* even plays all the national anthems.

It's great stuff—the kind of things you always wished for when you were in school. You can copy information from *Bookshelf* into the Windows Clipboard and then paste it to other applications. In fact, First Looks editor Robin Raskin was just in here with her 11-year-old daughter

Kari, gathering research material for a school report on Eleanor of Aquitaine!

This is the stuff that impressive demonstrations are made of, but *Bookshelf* is not without its problems. The number of animations is limited, and you only get to hear quotations from the three people mentioned above. The CD-ROM technology is slow; in some cases, you will wait a minute or two for the drive to find information. It would take much longer with conventional reference books, but this is a computer; we expect things to be instant. You'd have to conclude that *Bookshelf* looks neat, but wonder whether it's worth the \$1,000 or so premium that a multimedia PC or upgrade kit will cost.

But then you should consider other multimedia titles like *Multimedia Beethoven*, a Toolbook application running under Windows. Microsoft publishes this CD-ROM application in conjunction with The Voyager Co., which publishes a similar disk for the Macintosh.

Multimedia Beethoven includes a complete digital recording of the Ninth Symphony, along with comments from Beethoven scholar Robert Winter. "A Pocket Guide" steps you through each section of the symphony, letting you choose the parts you want to hear. "Beethoven's World" gives a history of the man and his times, and ties in the forces that impacted Beethoven's work. "The Art of Listening" explores musical architecture and the anatomy of a symphony. The final section quizzes you on what you've learned.

The combination is nothing short of stunning. Whether you're a classical music buff or someone trying to learn a bit about the form, it's a fascinating way to hear and learn about the music. *Multimedia Beethoven* is also a prime example of the kind of applications multimedia technology has in education.

Now does that mean there is a multimedia market? I don't think so, because I've yet to meet a teacher, parent, or businessperson who was looking for a "multimedia" machine. But I'm convinced there are great applications ready to be developed that will use the techniques routinely lumped together as "multimedia," whether audio, digital video, voice annotation, animation, or mass storage.

As a debate topic, multimedia signifies nothing. But for innovators creating new applications in areas such as education, training, and presentation, there's a great deal of life in the underlying concepts. ■

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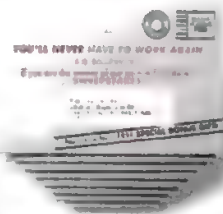
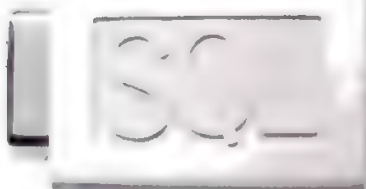
But this versatility doesn't come at the expense of power. Superbase 4 is fast. It lets you include an unlimited number of characters in any text field. And supporting SQL, it connects with some formidable

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In fact, Superbase 4 already manages a direct mail database containing over one million records. It could handle a lot more.

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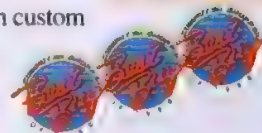
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Johnny Can Compute—At Home

It's time to reexamine the role of computers in education. The classroom is falling further behind than ever.

A reader's letter has forced me back to the subject of computers and education. Last year in this column, I examined the role of computers in the classroom and found them grossly underutilized and badly outdated ("Why Johnny Can't Compute," September 25, 1990). Seeing my own kids working on decade-old Commodore PETs and saving files on cranky cassette tapes made my head swim.

Education has always been a volatile topic, and adding PCs to the mix only makes it more so. After that column, I was deluged with mail. I was invited to see successful computer programs in primary and secondary schools. I

got requests for donations of our cast-off computer equipment. I got letters from parents and teachers alike, reminding me that computers were no substitute for competent teachers at the front of the room. Amen.

The business community remains almost entirely aloof, then complains about the quality of students and how it is left to complete their education. Meanwhile educators struggle with their own limited resources, fighting for budget dollars and precious classroom time.

User groups have taken up the challenge in some admirable ways. Members of the Capital PC Users Group have an ongoing program to build computer skills in some of the most seemingly hopeless students: those most likely to drop out because of shattered families, the fatal attractions of the street, and a lifetime of disaffection with the system. The triumphs and failures of these children coexist in poignant juxtaposition, a testimony to the challenges faced by both our youth and our society.

Far removed from those valiant rescue missions come you and I, middle-class folks who just want to do well by our kids. As my correspondent says:

"A few years ago, I bought an IBM PC and planned to use it as an educational tool for the family. Needless to say, it works great as a typewriter but suffers greatly in the education and applications environments of today. I have decided to reinvest in our family's future by

upgrading. But to what? With so much hardware and software available, what would be the best choices using a limited family budget?

"What type of hardware would enable us to use today's software products without the hardware becoming obsolete within a few short years? What are some of the better educational programs available? What kind of user software would help prepare my boys for college and the workplace? This may be just a father's dream, but wouldn't it be great for a 6th grader to turn in a report using the features of *WordPerfect* or *Lotus 1-2-3*?"

ACHIEVABLE GOAL?

When it comes to hardware, you can never be too current. But the current state of the art is so good that it's likely to last for years, and it's amazingly affordable. Super VGA displays are a must, as is a 386 and the biggest hard disk you can talk yourself into buying. Games and educational programs eat up hard disk space faster than anything else, and the whole point is having it instantly accessible. Anything less than 100MB is a waste of money; 200MB strikes me as a size with a workable future. You'll need 4MB of RAM and 512K of video RAM, too.



I've seen the first generation of Multimedia PC-compatible software, and I'm sure you'll want either a Multimedia PC (MPC) upgrade for your current system or a new MPC machine from Tandy, NEC, CompuAdd, or any of a dozen other manufacturers that comply with the new multimedia standard. With it, you get a CD-ROM drive and one of the new generation sound boards. They add a dimension of fun to many existing programs and make the

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Bill Machrone

computer a great game machine (a mixed blessing, when you want to get work done). You also get the latest version of *Windows*, complete with Microsoft's Multi-media Extensions.

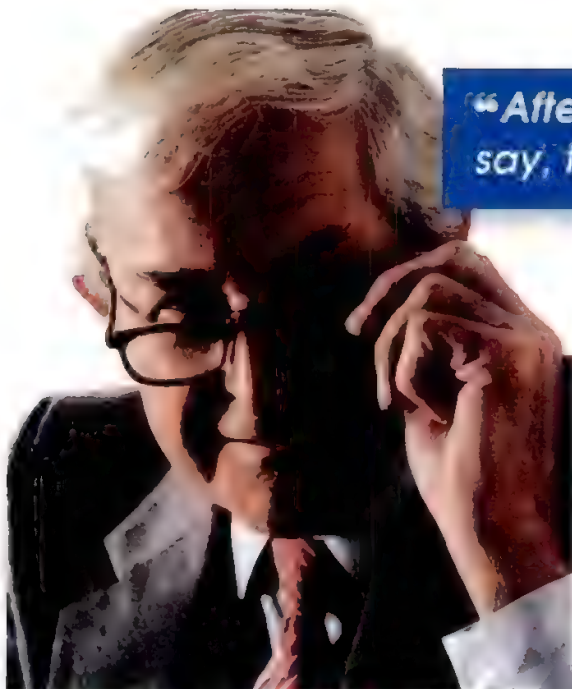
I'm no expert on educational software. When I want a good program for my kids, I go to Egghead Software and browse around. The Disney Software for preschoolers is great—*Mickey's ABCs* is the one my son Andrew used to like best. Of course, Disney went off in its own direction with an outboard sound module, the \$34.95 Disney Sound Source, but at least it's inexpensive. Andrew's current favorite is *Reader Rabbit 2*—I can't say enough about The Learning Company's product line. Even their games are educational, and the kids never seem to tire of them.

Also, consider Prodigy. I hang out on PC MagNet, but my kids love Prodigy. On vacation last winter, my daughter Stephanie met another girl her age on a Caribbean beach. They resolved to become pen pals. But instead of exchanging addresses, they exchanged Prodigy IDs. Sitting at a casual family dinner the other night, Steph looked at a Samuel Adams beer bottle and wanted to know if he was related to the other Adamses of the American revolution. My wife and I thought so, but she bounced over to the computer, logged onto Prodigy, and had the answer (yes, a cousin) in minutes.

But when it comes to writing and 'rithmetic, children should use the same software you do, with one exception. I think teaching a kid *WordPerfect* is tantamount to child abuse, but that's a personal prejudice. My own kids use *Windows Write* or *GeoWorks Write* for their word processing. Andrew and Stephanie especially like the latter for its generous supply of fonts and their complete scalability. Big fonts, and lots of them, matter a lot to the primary school set. And there's no reason why a 5th or 6th grader can't put some numbers in a spreadsheet, do a couple of simple calculations, and pull some pie charts or bar charts.

COMPUTING BEGINS AT HOME

Our children won't get any of this in school, though. There isn't time, and maybe school just isn't the place. You've got a machine at home. Improve it, and use it for their best interests. ■



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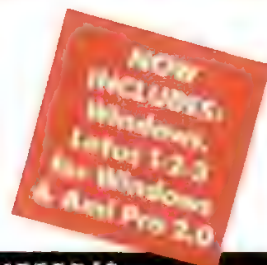
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CIRCLE 722 ON READER SERVICE CARD

John C. Dvorak



Taxed to Death in America

Government's craving for additional tax revenues is threatening the free exchange of public-domain software and shareware. It's time to get involved.

New York's bulletin board systems operators panicked. The financially strapped state government decided to slap a tax on BBS operators for distributing shareware. According to frenzied BBSers in New York, if a BBS operator charges a fee or receives either shareware or public domain software as a condition of downloading, then they must pay taxes. If the shareware package that is downloaded by someone costs \$45 for registration, then the BBS operator is liable for the tax. If it's public domain software, then the BBS operator is supposed to attach a value to it and pay tax.

It will be a while before we really understand the new taxation and its ramifications. Whatever happens, it brings to light the problems with taxation of software.

Sales tax has always been a controversial method of collecting money. People hate it. It's the worst kind of tax, because it discourages spending, which is necessary to economic growth. First you're taxed when you make the money. Then

you're taxed if you spend the money you have left. It makes no sense that the public puts up with this.

To make matters worse, the sales tax people are always looking for ways to collect more of it. If I buy mail order from out of state, I'm now supposed to pay sales tax. Originally the sales tax was justified within the state because if you buy from a local merchant, the state is paying for the upkeep of the road and utilities used by you and the merchant. By providing certain services, the state helps the merchant stay in business. Well, this is hardly the case with mail order!

One would assume that taxes would stabilize and remain relative. As the economy grew, so too would the tax coffers. As efficiency increased, less tax would be necessary to run the machinery of government. All that would be necessary is an equitable income tax to cover all expenses of government.

Apparently not. In fact, the legislators had to invent luxury tax, inheritance tax, and sales tax in an effort to get more and more money to squander.

Do I sound enough like an old grump with this tirade? Taxes have become so pervasive

that you can't even complain about them anymore without sounding crazed. We're doomed!

So now we move on to software. How is software taxed anyway? How can it be taxed? Ninety-nine percent of all software on the market is sold under a license. It's never bought. It's not property. It's never owned by the user. So how can software be taxed? It's like taxing movie rentals (which most states do). It's amazing that "sales" tax has, in many cases, become "rental" tax. With software it's a "license" tax. And now with a BBS it's a "download" tax.

In California they're taxing people for food (I suspect they would tax the breathing air if they could), so taxing them for downloading software will be easy to justify. "Gentlemen, how can we tax people for food and *not* tax them for something less vital, something like downloading?" You can see this stuff coming a mile away.

Unfortunately, the public officials just don't get it. Americans don't like taxes. Some politicians are so oblivious to this fact that it's gotten to the point where a Presidential candidate (Walter Mondale, remember him?) actu-



ILLUSTRATION: DAVID TURNER

ally ran on a platform of raising taxes! And the amazing thing was that he actually got votes.

Here's my advice. Keep a close eye on your state and local politicians and their plans for sales taxes. Each computer user's group should have a watchdog committee. There is always a state capital-based computer users group that's filled with politicians who can help you. If we're taxed to death, it's our own fault for not doing anything about it. You know, it's okay to get mad about this stuff!



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performance,
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CIRCLE 149 ON READER SERVICE CARD

Inside Track

Expect to see **386mania** reignite the personal computer market over the next 12 months. That's what many experts feel will be the fallout from the **sudden emergence** of two more 386 chip manufacturers. The latest to join the club is **Chips and Technologies**, whose line of 386 products includes a superset version of Intel's 80386 with some unique capabilities. By the time you read this, **Cyrix** will have announced its version of a 386, too.

While C&T has a pin-compatible 386 and 387 coprocessor (called the Super Math 387) to match and raise the **ante of AMD** with its 386 clone chip, C&T has also shown a version of the 386 with a **different pinout**, with what the company calls **superstate capability**. In short, the C&T chip has capabilities that include the ability of the CPU to **virtualize itself**.

This means that the chip can pretend to be multiple complete versions of itself, opening the door to a **true PC-based, VM-like** operating system. With a VM manager similar to the VM OS found on IBM mainframes, this superstate 386 could have *Microsoft Windows*, MS-DOS, DR DOS, UNIX, and OS/2 all **running simultaneously**, each within their own unique environments. The user could effortlessly switch from one operating system to the other.

VM means "virtual machine," and up till now it has not been fully achieved on the Intel family of 80x86 microprocessors. When I've asked about the Intel family of chips self-virtualizing (something many engineers believe could have been incorporated into the 386 and 486), I'm always told that it's not important. Yeah, especially if you don't want to compete with mainframes.

The **superstate version** of the 386, according to C&T sources, will **outperform** a normal 386 at the same clock speed by 40 percent or more because of its increased capabilities. It is **downward-compatible** with the other 386 chips.

Intel, meanwhile, says it will be shipping the **586** before the end of next year. While Intel will continue to lead the pack, it's now apparent that the 386 will be the base machine for **cheap desktop computing** for the next few years. Expect to see a 25-MHz 386 system for \$500 within two years. Wow.

Church Alert: It amazes me how many churches and temples are computerized in this country. The market is served by a large group of vendors who are, for the most part, not well known. Few of them advertise in *PC Magazine*, or anywhere else, for that matter. So **finding software** for your

church hasn't been easy. Until now. *The Software Bible*, from Communal Computing (P.O. Box 6599, Silver Spring, MD

20916; 301-598-9062; fax: 301-598-9052), has information on 500 packages successfully used in religious organizations. Everything from church management software to religious clip art packages is covered. It's \$15.95. Perhaps you might want to **donate a copy** to your local church as an unusual Christmas gift.

Magazine of The Month Dept.: I've been meaning to

plug this awesome magazine for years. If you're at all interested in **computers and music**, then you have to get a subscription to *Electronic Musician* (ACT III Publishing, 6400 Hollis St. #12, Emeryville, CA 94608; 800-888-5139, 510-653-3307, fax: 510-653-5142, \$24 per year). This very slick monthly magazine, which you can find at most good newsstands, covers the latest in everything electronic from keyboards to computers to software. It really **makes your mouth water** to look at some of the gear that *Electronic Musician* shows off in this magazine. In fact, one of these days, I think I'm going to produce a song!

While in the Mood for Giving Plugs I Might as Well Give Another Since It's the Holiday Season Dept.: If you're at all interested in **fractals**, then run right out and buy this book: *The Waite Group's Fractal Creations*, by Tim Wegner and Mark Peterson, \$34.95, 315 pages; includes disk with Fractint, 3-D glasses, and fold out color poster. Waite Group Press is at 100 Shoreline Highway, Suite A-285, Mill Valley, CA

94941; 800-368-9369, 415-331-0575.

Besides coming with a nifty (and free) **fractal generator**, plus 70 built-in fractals, *Fractal Creations* has one of the most concise and easy to understand explanations of fractals that I've seen. Nothing else comes close to describing what the fractal scene is all about. I figure that at some companies, if you know about this stuff **you'll be promoted**. This book will bring you up to speed.

The Future Is Now Dept.: Here's an anecdote I think you'll enjoy. It comes from reader Geoff Fox:

"Friday night, I brought a typewriter home from work so I could fill in a seven-part form. My four-year-old daughter took a look and said, 'What's that, Daddy?' I answered, 'A typewriter.' She asked again, 'What's that?' I scrambled to find an analogy a four-year-old could handle. 'Uh, it's like a printer.' 'Oh, okay,' she said."

According to sources, the superstate 386 from Chips and Technologies will outperform a normal 386 by 40 percent or more, while remaining downward-compatible.

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1/ 1/91 Through 8/31/91
DBR12-Bank, Cash, CC Accounts
8/ 9/91

Category Description	1/ 1/91- 8/31/91
Total Dining Out	887.55
Entertainment	110.00
Transportation	110.00
Utilities	110.00
Medical	110.00
Insurance	110.00
Real Estate	110.00
Charitable	110.00
Gifts	110.00
Other	110.00
Total	1,100.00

Transaction List

Date	Num	Desc	Cat	Amount
1/1/91	101	City Opera	Entertainment	110.00
1/1/91	102	City Opera	Entertainment	110.00
1/1/91	103	City Opera	Entertainment	110.00
1/1/91	104	City Opera	Entertainment	110.00
1/1/91	105	City Opera	Entertainment	110.00

Ever question a number in a report? One keystroke, and a new QuickZoom screen pops up with the supporting details. Need more detail? Tap that key again to zoom in on any transaction.

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Follow-Me-Home research: Intuit engineers visit new buyers to study their first session with Quicken. As a result, we've introduced a new step-by-step guide for those who want help getting started.

Each year we survey 10,000 users to learn how they'd change Quicken. These surveys led to Quicken 5.0's advances in report flexibility and automatic budgeting.

With Quicken, you have the culmination of years of refinements...and a future of relentless improvements.

That's how Quicken has grown — from a simple checkbook manager into a powerful financial tool that categorizes expenses as you pay bills, reports exactly where your money goes, furnishes tax reports, tracks your investments, and keeps the books for thousands of small businesses — all with the intuitive simplicity and speed of the original.

Mouse support was the top request in Customer Suggestion cards. It's in both new versions.

New reports show interest and principal for each house loan... reveal missing checks at a glance ... provide tax schedules ready to submit with your returns, and more.

New budgeting power. We've made the hardest part — creating a budget — simple and fast. You can copy one month's budget to all other months or let Quicken automatically create a budget for you based on your actual spending, and tweak it from there.

We've made budgeting more precise, too, with subcategories. Under "Automobile" for example, you can allocate separate amounts for gas and maintenance. You can also budget a yearly amount for a category and let Quicken allocate it quarterly or monthly.

BUDGET
Jan. Feb.

Category Description	Jan.	Feb.
Automobile	50	50
Banking	25	25
Books	25	25
Charitable	100	100
Clothing	50	50
Computer Software	200	200
Dining Out	200	200
Entertainment	1,000	1,000
Federal Tax Withholding	50	50
Gift Expenses	200	200
Groceries	50	50
Home Repairs & Maint	50	50

STEP 1
Simply select the new AutoCreate command from the new pull-down menu and Quicken automatically fills in your budget based on last year's spending. Now play "what-if" until you see the results you want, and you've got a detailed plan to meet your financial goals.

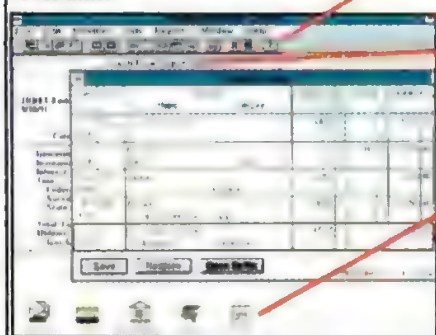
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Only Quicken lets you see multiple account and report windows on screen at once, so you can investigate the detail behind numbers and easily plan and forecast.



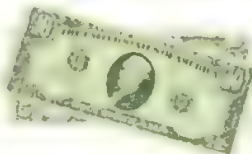
Create your own Quicken desktop, and keep your most frequently used accounts, lists and reports where you can always find them fast.

Upgrade at your software dealer — and get \$15 back!

Quicken owners: Buy either new version of Quicken at your favorite store before December 31, 1991 and get \$15 back. Here's how:

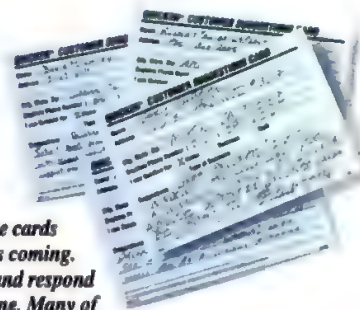
- 1) Buy either Quicken 5.0 or Quicken for Windows at your local dealer. (Some stores are providing the \$15 rebate at the time of purchase. These purchases do not qualify for another rebate by mail.)
- 2) Circle Quicken's purchase price and date on your store receipt.
- 3) Turn to the back of your old Quicken manual and tear out the Special Offer Coupon #2.
- 4) IMPORTANT: Fill out the information on the back of Special Coupon #2. On the "Additional Information" line, write in your disk size preference (3.5" or 5.25") and whether you bought: Quicken 5.0, Quicken for Windows, or the Quicken/TurboTax combo. (Combo available in stores about 11/11/91.)

- 5) Mail your original store receipt along with your completed Special Coupon #2 to: Quicken Rebate Offer, 5070 Santa Fe Street, San Diego, CA 92109
- 6) Receive your rebate check for \$15 within 6 weeks.



Important Information: Offer valid only for owners of Quicken versions 1-4. Rebate good on retail store purchases of Quicken 5.0 or Quicken for Windows only (rebate good on one or the other, not both). Mail-in rebate not valid for Quicken purchased at stores giving the rebate at the time of purchase. Your receipt must be dated by December 31, 1991, and your letter postmarked by January 15, 1992. Original store receipt and original Special Coupon #2 must accompany request. No mechanical reproductions, photocopies or faxes accepted. Void where prohibited by law.

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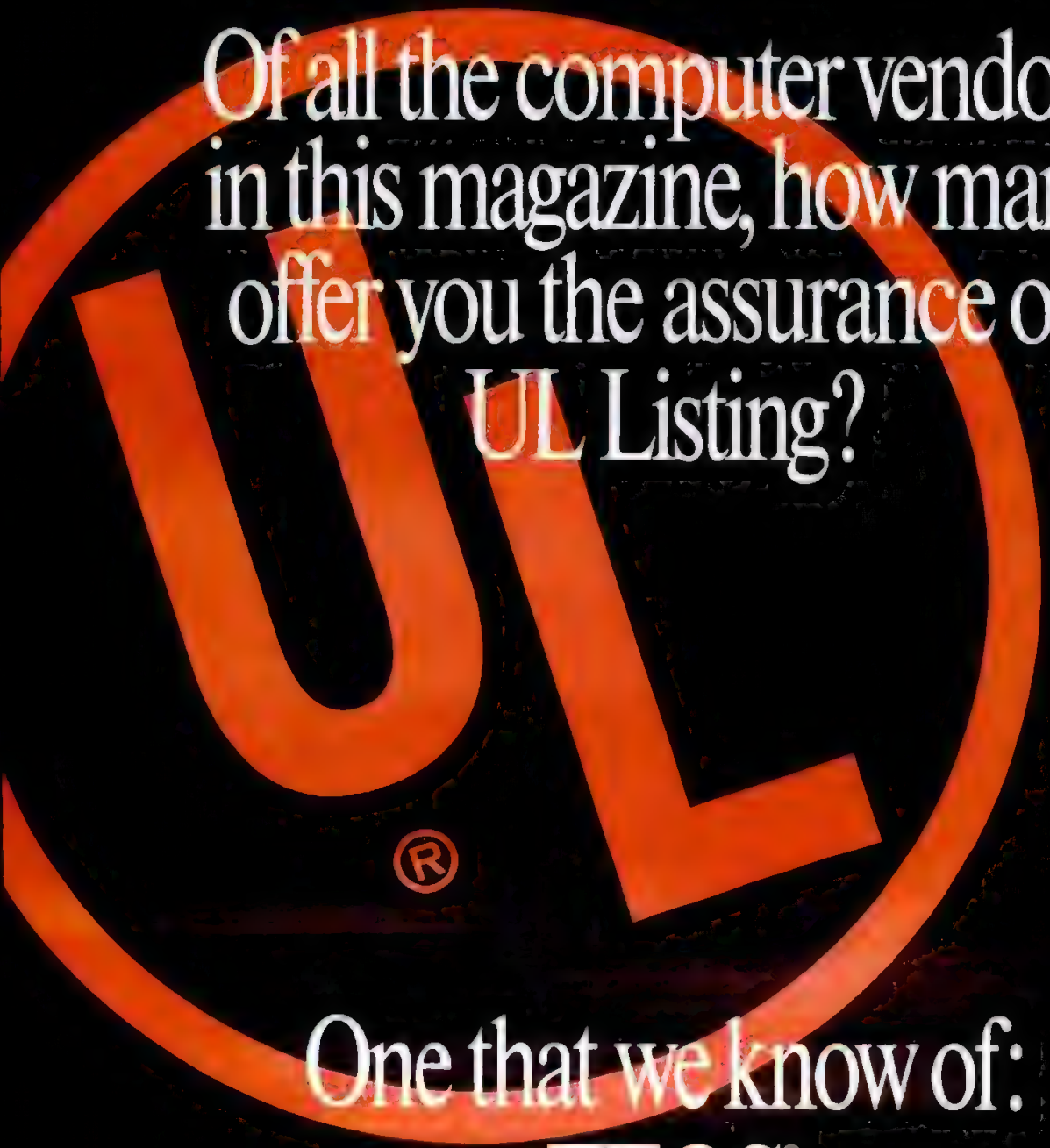
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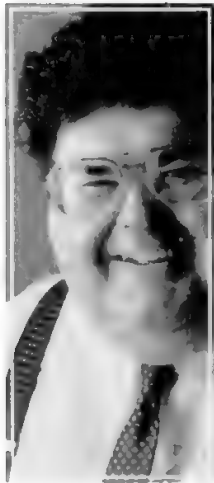
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CIRCLE 513 ON READER SERVICE CARD

Jim Seymour



LAN Software: Pricing in Crisis

The confused pricing schemes for network software are guaranteed to anger LAN managers and users everywhere.

With apologies to Meredith Willson's *Music Man*, we've got big trouble right here in LAN City. The hot issue is LAN software pricing. What until recently has been merely a mess is descending quickly into an angry standoff between software publishers and LAN managers and buyers.

The problem is the incoherent, inconsistent, and unresponsive approach that LAN software vendors presently use to set prices for their networked applications. Software vendor A charges customers a flat fee to put its program on a server. Then, any number of users can connect to and simultaneously use that program.

Meanwhile, publisher B charges a flat fee for the first 10 users, then an extra fee for each additional block of 10 more users. Those users can be any employees of the company; again, all that matters is the total number of simultaneous users of the program.

Now comes publisher C, who not only wants a flat fee for loading the software on the server and getting the first few users going, plus an additional fee for all other users after that first bunch...but also demands that those be "named users." In other words, the program isn't available to *any* 10 or 20 legal, licensed number of simultaneous users, but only to specific individuals (or network-workstation nodes), identified by license.

The people who buy and manage networks for American business are getting damned tired, they tell me, of being shuffled around and double-dipped by network software vendors. They want clear and sensible pricing policies, and they want those policies to reflect both the realities of the software business and also the realities of the business world.

WHAT'S THE BOTTOM LINE?

I often break the network-pricing, decision-making process into a three-layer decision tree. This model helps assess the appropriateness of network-license pricing, so let's look at these layers for a moment.

The first decision is simple: server-based pricing, or user-based pricing? In other words,

is there a flat fee for installing the package on one network server, after which all users with server access can legally use the program? Or is there some form of per-user charge—either a first-users charge (a network pack which allows, say, five users to access the program once it's been installed on the server), or some hybrid pricing structure which assesses a flat fee for putting the software on the server, then adds so much per additional n users?

If the answer on this level of the decision tree is "Yes" to the second alternative—some form of per-user charge—then we go on to the second, most controversial level: maximum-number-of-simultaneous-users pricing, or named-users pricing.

The overwhelming preference of corporate network managers, and my own unshakable favorite, is multiple concurrent-user pricing. That is, a designated number of users can use the program at any given moment. It doesn't matter who those users are, nor where they are. If they have access to the server upon which the master copy of the program is resident, they can legally use it.



By contrast, the named-users approach demands that the customer buy a license for each user who may want to use the program at some point—even if that's only once a year.

You can see why network managers hate named-user pricing. Not only does it make their lives much more difficult, it also makes using a networked application a lot more expensive.

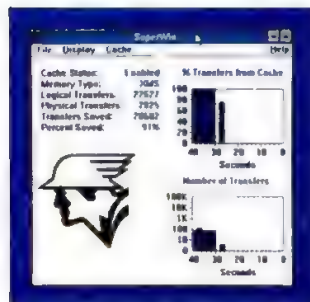
Whichever way a vendor decides to go with per-user pricing, we now get to the third and final layer of this pricing model: the actual net per-user charge, and whether—and how



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CIRCLE 170 ON READER SERVICE CARD

Jim Seymour

quickly—that incremental *n*th-user price declines.

Corporate computer buyers believe that price should fall fairly quickly, after the first 50 or 100 users—and keep falling. They make the point that it's far cheaper for a software publisher to sell 2,500 licenses for the use of a program within a large company, where that company's own internal help-desk operation will support it, than to sell 2,500 copies to individual users, or even 25-user network licenses to a hundred smaller companies.

Unfortunately, software publishers often disagree here with buyers. Vendors believe that prices should fall perhaps 20 to 25 percent over the first few hundred copies, but essentially stabilize thereafter.

TROUBLE ON THE NETWORK

In the midst of all this confusion, there's a growing sense of inequity among network managers and users. On the one hand, individual users are being bombarded by reminders from the Software Publishers Association and others not to make and use illegal copies. And LAN managers are under pressure to make sure their operations are clean and legal—without spending a dime more than they have to.

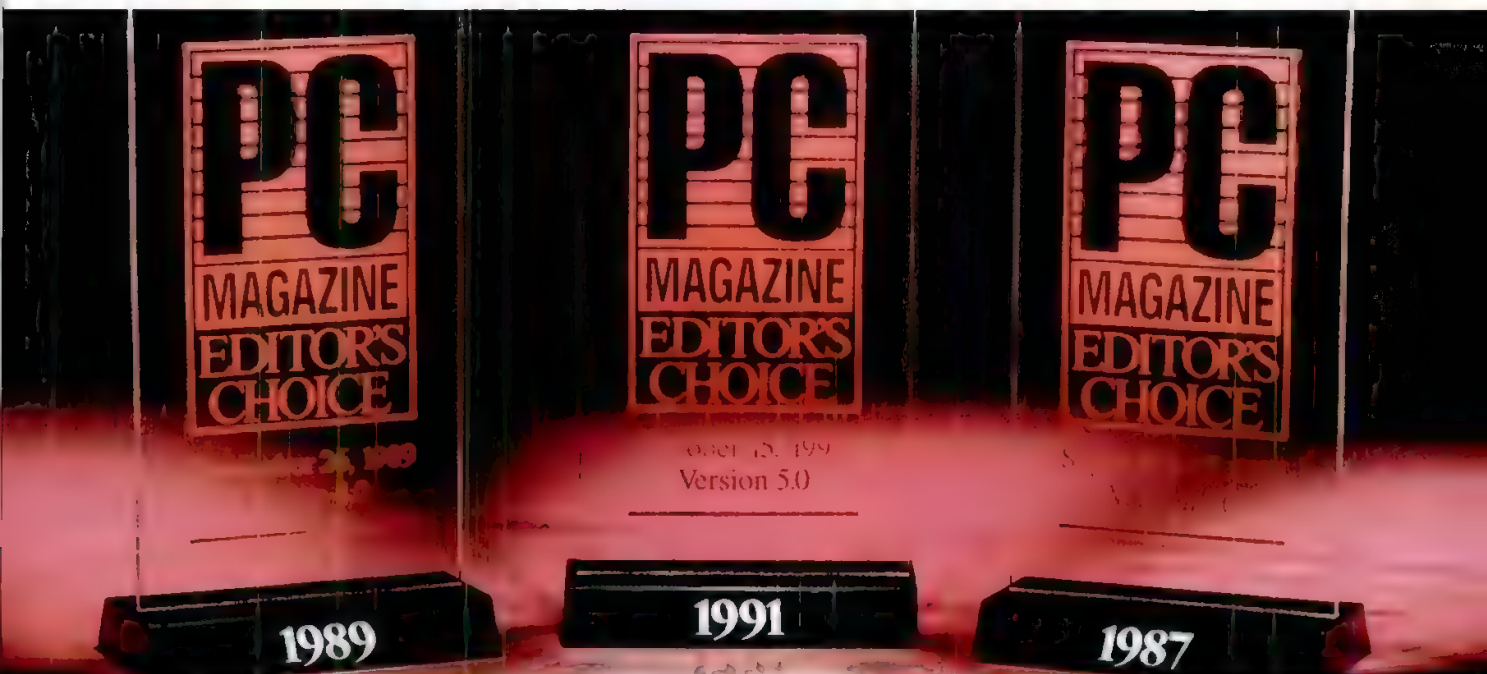
On the other hand, they feel they're getting gouged by software vendors. And for the software industry to scattershoot a variety of hard-to-follow and unpopular pricing schemes into that situation is incendiary.

I'm not going to say that the madness in network-applications pricing is going to bring the LAN business grinding to a halt. The continuing success of Novell, despite *NetWare's* outrageous pricing, needless difficulty in installation and maintenance, and the company's abysmal support of its customers, shows that *nothing's* going to slow the move to networks in American business.

But software vendors are reaping a harvest of ill will and frustration from the very group they must sell to. Yet that could change in a moment if those publishers listened to their customers and responded to those customers' complaints.

Next issue I'll go through the flaws in current network-applications pricing, and what some of the people who have the power to change those policies say they see coming.

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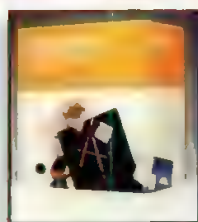
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C++ Makes OOP Benefits Practical

New compilers have given renewed vigor to a ten-year-old computer language.

C++ is an object-oriented superset of the standard C programming language, the most widely used language for sophisticated software development for PCs. The majority of commercial personal computer software products are now written in C.

C++ was conceived by Bjarne Stroustrup at AT&T's Bell Labs over a decade ago, but reliable and efficient commercial C++ compilers have only recently been available. They have projected C++ into the front lines of the battle for the hearts and minds of computer programmers.

The success of C++ lies in its dual nature: It is both a modern object-oriented programming (OOP) language, and a standard, well-known ordinary procedural language. The combination provides three important advantages:

easy transition to OOP for programmers already familiar with C, the ability to incorporate existing code into an OOP environment easily, and efficiency in compiling and executing the code.

Object-oriented programming concepts played an important role in the development of the Apple Macintosh operating system and user interface.

Even on the Mac, however, OOP has not played a very big role in application development. The discontinuity between ordinary programming languages and newer, relatively "pure" OOP languages such as Smalltalk, limited their practical utility. It wasn't until C++ compilers from Zortech and Borland became available around the end of the 1980s that OOP became a viable option for the development of serious applications for IBM and compatible systems.

C++ delivers OOP capabilities in an evolutionary form, based on standard C. Objects are implemented by extending C data structures. The C-language "struct" and "union" syntax is expanded to allow member functions as well as member data, and a new but closely related "class" keyword is added.

The result is an easy transition from C's traditional structured programming hierarchy of function calls and associated function libraries to the world of C++ objects and class libraries. This has consequences with important benefits for software development. The most important is that C++ makes it much easier to create a software foundation, in the form of class libraries, on which new software can be built.

Function (or subroutine) libraries are limited in several respects. The individual functions are not systematically related to one another. A function may invoke or be invoked by other functions, but beyond that, individual functions have no defined relation to one another. A programmer must learn each new function in an unfamiliar library—much like learning a brand new API.

OOP class libraries, on the other hand, are relatively orderly and well defined. Object classes can have well-defined relationships with one another (via inheritance). The member data elements and functions of each class have explicit relations to one another, and access to them can be explicitly controlled (via encapsulation). Individual function names

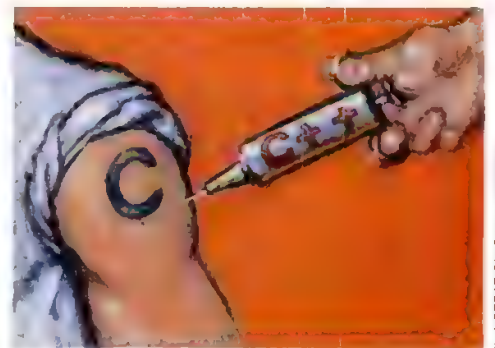


ILLUSTRATION DAVID TURNER

can be defined across multiple classes (via polymorphism). Objects can provide a much higher level of capability than do individual functions.

These characteristics make it easier to build on software that has already been written or developed by others. Class libraries from third parties can be learned and put to use more quickly than traditional function libraries. The key benefits are speedier and less costly software development. ■

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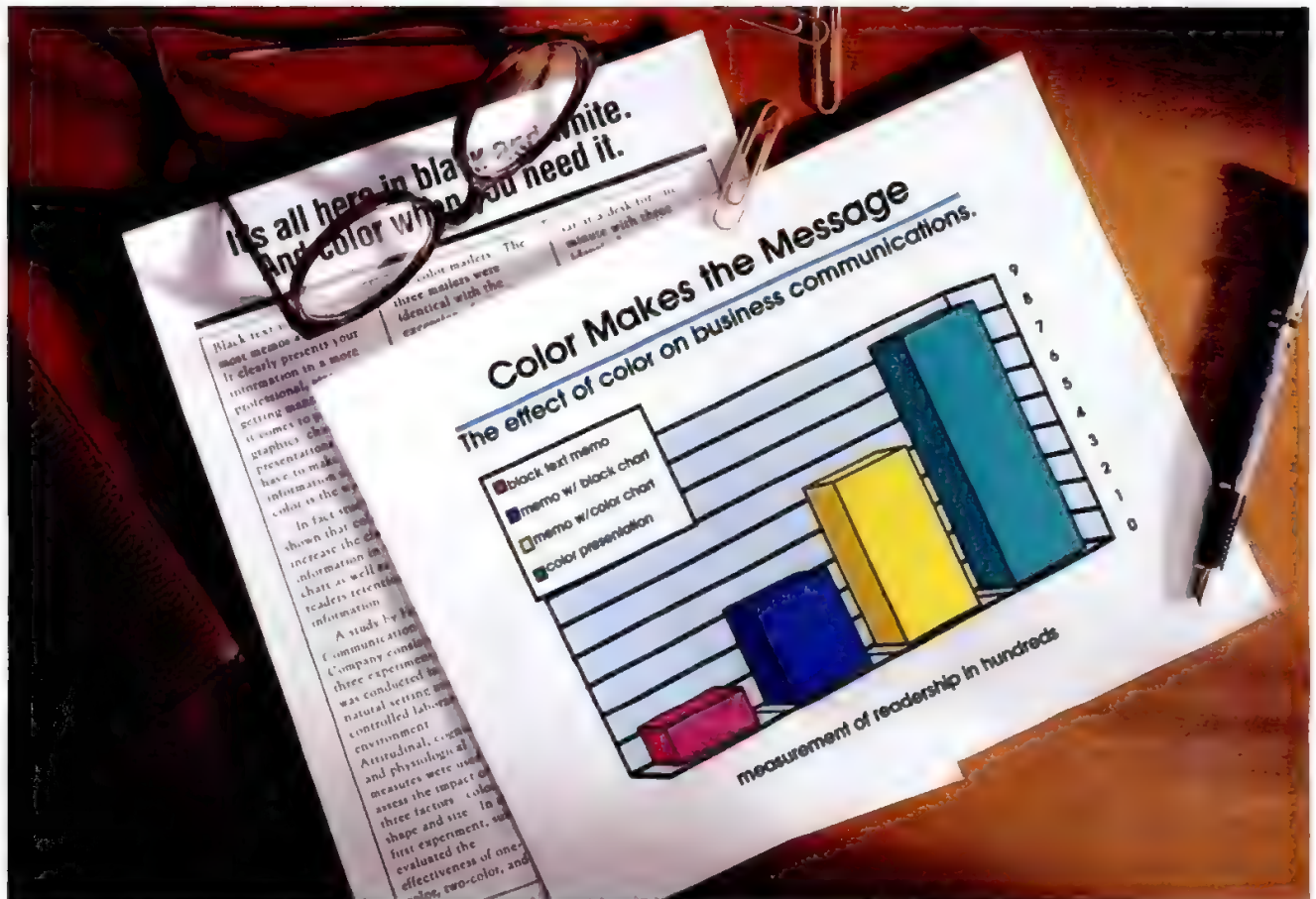
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THE NOTEBOOK.

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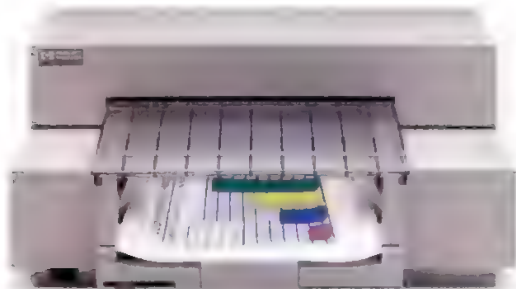
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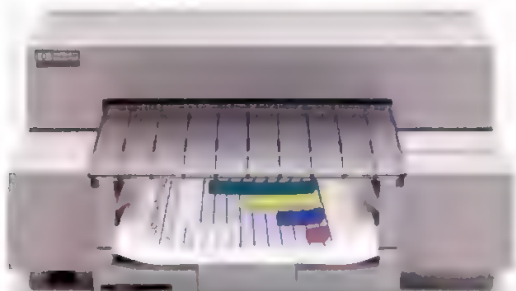
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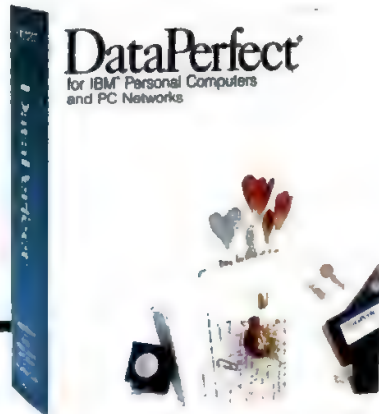
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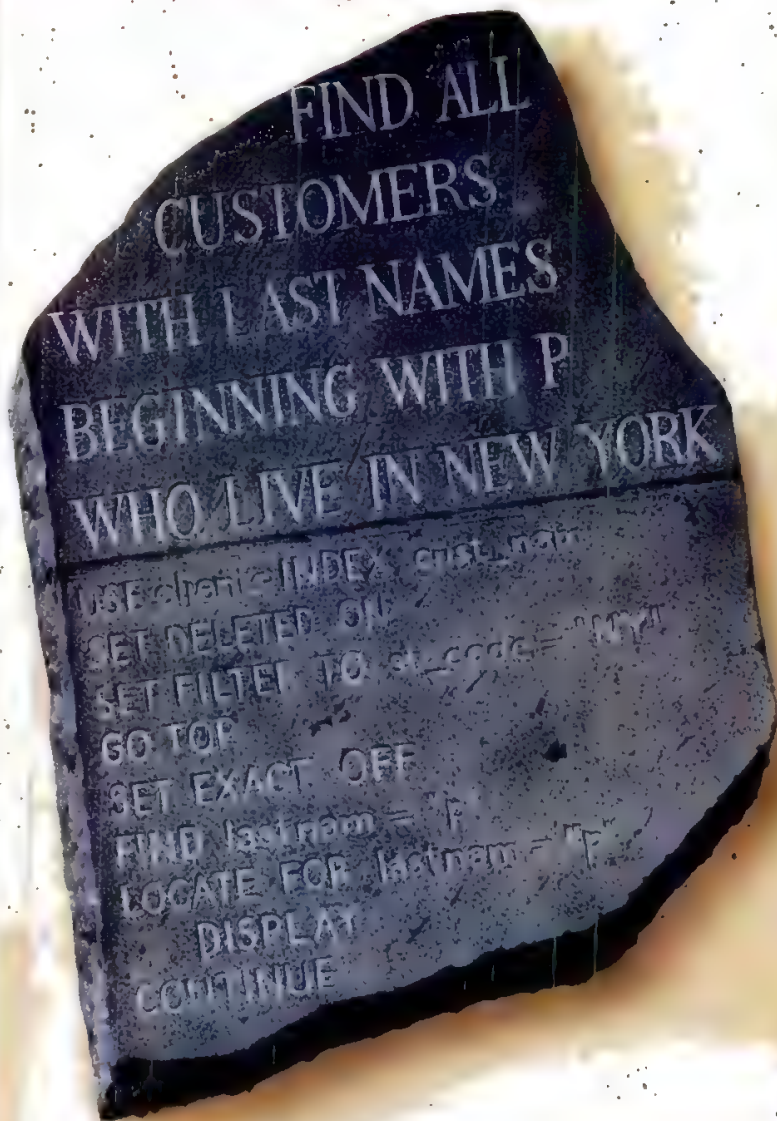


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Database Power Without the Programming

FLAT-FILE DATABASES USED
TO BE LITTLE MORE THAN
MAILING-LIST MANAGERS.
MOST OF THE TEN
DATABASES IN THIS REVIEW
WERE BORN IN THOSE DAYS
AND HAVE CONTINUED TO
ADD FEATURES, INCLUDING
RELATIONAL JOINS,
SOPHISTICATED REPORT
GENERATION, AND THE
BIGGEST LEAP: POWERFUL
APPLICATIONS
DEVELOPMENT.

BY JOE SALEMI



As the database market becomes more crowded and complex, most of the attention is focused on the future of the *dBASE* language and client/server architectures.

SQL servers, SQL front ends, and sophisticated applications development systems are all vitally important pieces of the high-end database computing puzzle, but what if you just want to print 100 mailing labels? A nonprogrammable

database package may be just what you need if your database management tasks don't require the manipulation of large amounts of data.

You'd be making a mistake, however, if you assume that a low-end database is limited and unsophisticated; the vendors of the ten products evaluated here (priced from \$79 to \$549) have remained in stride with the advances in the field. You'll find these packages easy to learn and use, but you won't find yourself frustrated by limitations as your data management needs increase.

FLAT-FILE VS. NONPROGRAMMABLE

In the past, the term *flat-file database* was used to describe low-end databases since most of them had little or no relational capabilities and stored all of their data in a single file. While this is still true of *File Express*, *Nutshell Plus II*, *PC-File*, *Professional File*, *RapidFile*, and *Reflex*, some packages include sophisticated lookup functions that can be used to extract data from other files. And while databases such as *Alpha Four*, *Clarion Personal Developer*, and *Q&A* can be designed to

use only one file, you'll find these packages capable of manipulating multiple data files with the same ease. Even *Personal R:BASE* is deceiving; although it stores its data in one file, that file is part of the same relational structure used by the full *R:BASE* package.

To accommodate the advances made in these products since we last looked at flat-file databases ("Flat-File Databases: Fast Answers to Easy Questions," June 26, 1990), we've broadened the category to include all database packages that do not have a distinct programming language.

DATABASES NONPROGRAMMABLE

Many of these
products can act as
front ends to more-
powerful databases.

But even the designation of *nonprogrammable* is somewhat misleading. Many of these packages have the ability to create fairly complex applications using key-stroke editors, macros, and menu builders. The difference between these and the packages we reviewed this year ("15 Relational Databases: Power," March 1991) is that there is no need for you to be a programmer to get the

DATA ON THE G

Despite the increasing sophistication of these databases, many can be employed by the traditional functions of databases, such as maintaining mailing lists, and performing printing labels, and several can perform mail-merge letters and to other several different data for word processing files.

Many of these products are a front end to other, more-powerful databases, making them particularly

NONPROGRAMMABLE DATABASES: SUITABILITY TO TASK

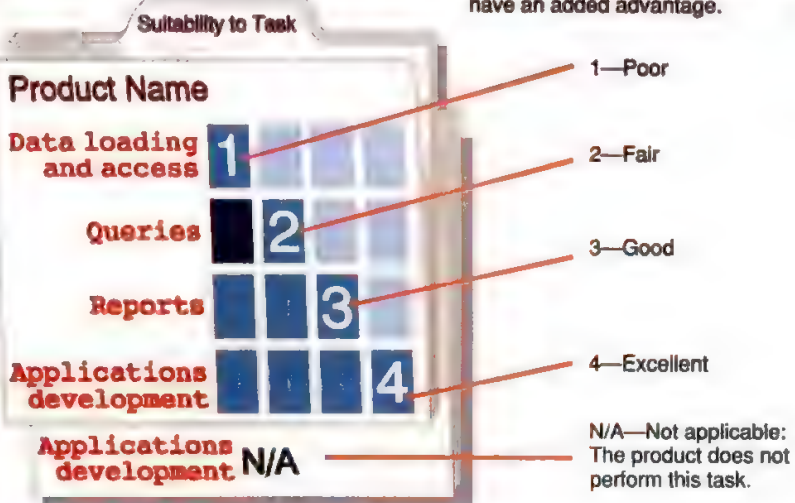
In judging the nonprogrammable databases on four categories—data loading and access, queries, report writing, and applications development—the biggest surprise was the strength that many products showed in applications development. Queries tended to be the weakest area among this group.

In assigning the score for data loading and access, we consider the program's ability to import and export several types of data files, its loading and indexing speed, the number of indexed fields per record and the number of indexes per database it allows, and its ability to be used as a front-end tool for other databases.

For the queries score, we examine the number of search parameters the program offers and the kinds of searches it can do. To score well, the program should have the ability to conduct ad hoc searches on nonindexed fields and should do so speedily.

For the reports, we look at the program's mail-merge facilities (and its related page-breaking logic), its ability to deal with variable-length data over several pages, its mailing-label handling and multicolumnar label printing, the number and quality of its printer drivers, its font selection and control, and its ability to do graphs, columnar reports, and fixed-length form handling.

These nonprogrammable databases are not meant to be strong tools for applications development in the same way that higher-end programs like *dBASE IV* or *Paradox* are, but several do offer simple application design tools. In order to score well, a program should generate custom menus and screens (in addition to reports). We also look for the types of input facilities and data types the program offers. Programs with referential integrity have an added advantage.



A polar bear is shown in a snowy, mountainous landscape, yawning with its mouth wide open, revealing its teeth and tongue. The bear's fur is white and slightly matted with snow. The background is a vast, snow-covered expanse under a pale sky.

Guidelines
For Safe
Shopping In
The Wilds
Of The
Computer
Industry.

 **GATEWAY2000**

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The computer industry is a treacherous wilderness of sorts. In it you'll find dense thickets of confusing jargon. Swamps of advertising claims laced with quicksand to suck you in. And hungry predators hunting for prey. To prevent you from becoming a delicious lunch for one of them, we've prepared the Gateway 2000 pictorial survival guide for shopping in this wild kingdom.

Guideline #1 – Don't fall prey to high prices. A number of PC manufacturers would have you believe a computer

To High Prices.



with their brand name is worth hundreds, even thousands of extra dollars. Is there intrinsic value in a name? The wily wilderness shopper knows that real value is a combination of features, performance, quality, service, company stability and price. The system that compares favorably in all of these categories is the best buy.

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Beware Of Those Who Would



Guideline #2 – Beware of those who would turn their backs on you. We've been in this industry for six years and we've seen a lot of PC manufacturers come and go. In the direct market channel, starting a business is easy. Staying in business is not. It's survival of the fittest, and the only companies that grow and prosper are those with an abiding commitment to quality and service and the financial strength to back it.

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GATEWAY2000

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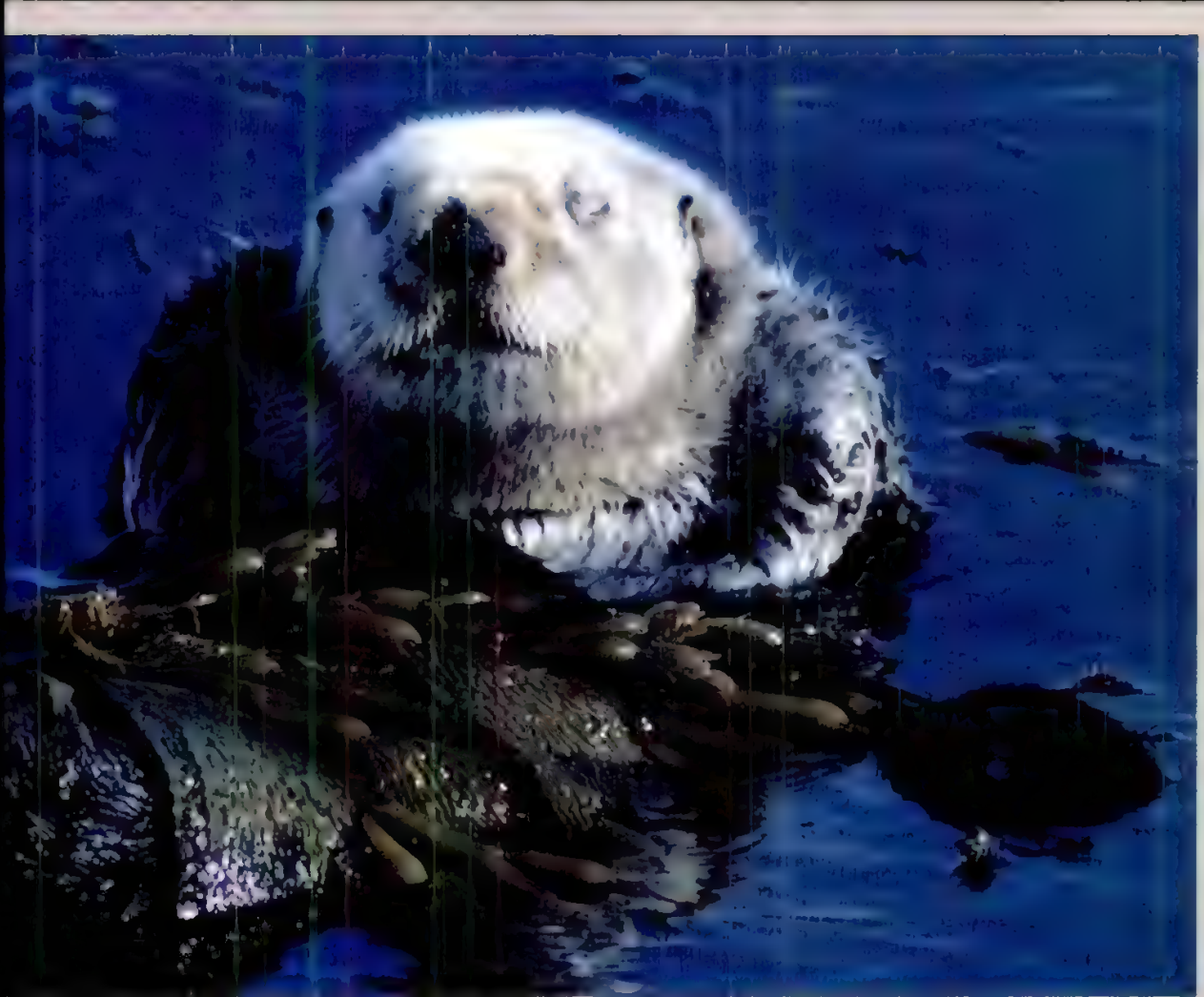
Just Relax And



Guideline #3 – If you don't want to worry about guidelines #1 and #2, just get a Gateway and you can relax.

Gateway 2000 holds a unique position in the wilds of the computer industry. The industry giants with their inflated prices live high on a mountain. At the foot of the mountain is the valley of the clone-makers where prices are great but quality and service are sometimes questionable and business is shaky. The outstanding little companies quickly grow and move up on the mountain where they raise their prices. This is the pattern of nature in the industry.

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- 1 PS/2 Mouse Port
- 124-Key AnyKey™ Keyboard
- MS DOS® 5.0

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33MHZ 486

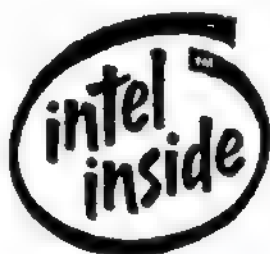
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- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
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- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
- Microsoft Mouse
- MS DOS 5.0
- MS Windows 3.0

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33MHZ 486 EISA

- Intel 80486 Processor
- 128K Cache RAM
- 8 MB RAM, Expands to 64 MB
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- 1.44 MB 3.5" Drive
- 340 MB 15ms SCSI Drive with 128K Multi-Segmented Cache
- 32-Bit EISA SCSI Controller
- 16-Bit VGA with 1 MB
- 14" Crystal Scan 1024NI Color VGA Monitor
- 1 Parallel/2 Serial Ports
- 124-Key AnyKey Keyboard
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- MS DOS 5.0
- MS Windows 3.0

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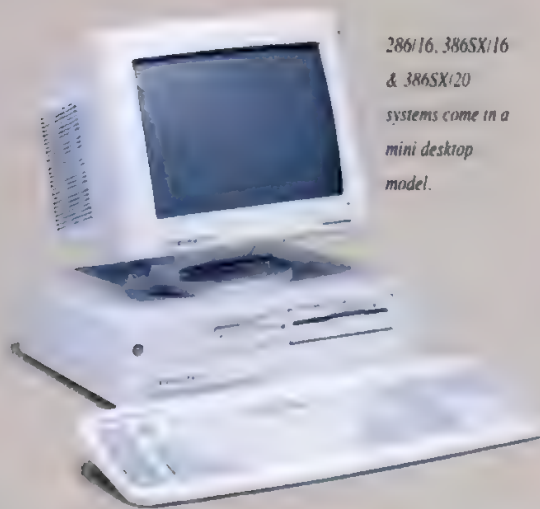


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mini desktop
model.

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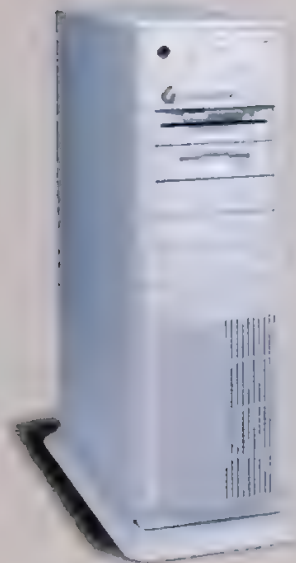
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The desktop model
is standard for
386DX & 486
systems.



The tower model is
an option for 386DX
& 486 systems.



users of laptop systems who need to take their data with them when they leave the office. While all of these packages can import and export data in the standard *dBASE III Plus* format (.DBF), *Alpha Four* and *PC-File* stand out because they use .DBF files as their native format, with no conversion required. *Professional File* and *Q&A* look up data directly from external .DBF files, and the latter can also post

(update) data directly into an external .DBF file. *Q&A* can even access data from a number of SQL database servers by using drivers from the vendor. *Clarion Personal Developer* and *Personal R:BASE* are application- and file-compatible with their larger counterparts and are particularly suited for the portable use of applications developed under the larger systems. *Personal R:BASE* also retains *R:BASE*'s ability to manipulate .DBF files directly.

Graphical user interfaces (GUIs) continue to move to the forefront; *PC File* now sports both a full GUI and a character-based GUI, and *Reflex*, which has not been updated since our last review, is entirely graphics-based. Both products also contain extensive graphing capabilities. *Clarion Personal Developer*, *Personal R:BASE*, *Professional File*, and *Q&A* have their own character-based GUIs, and the next release of *Alpha Four* will also have a new interface.

LOW-END...LOW POWER?

At one time, users of the low-end packages could expect them to run out of steam eventually: The size of the data files was often limited to 65,000 records, and simple operations such as sorts and searches could slow to a crawl on larger databases. Fortunately, this is no longer true for most of the products we've reviewed; only *Professional File*, *RapidFile*, and *Reflex* still have a limit of 65,000 records or fewer.

PC Magazine Labs ran two sets of performance tests, with sample databases of 1,000 and 10,000 records. We found that performance didn't noticeably degrade when we tested the larger files, and that the timings were in the expected range of approximately ten times those of the smaller files. We did encounter problems with the packages that are unable to import fixed-field ASCII files directly (see the reviews); these databases had to convert the data into .DBF files before completing the tests. *Clarion Personal Developer*, *File Express*, and *Professional File* had problems due to their 14-numeric-characters-per-field limitation.

The lack of programming languages had another negative effect on these databases: The reporting modules aren't as sophisticated as those found in the high-end products. All of the packages can create columnar reports, and *Personal R:BASE*, *Professional File*, *Q&A*, and

These packages will
more than suffice for the
needs of a casual
database user.

Reflex can also do crosstabs. Our test reports called for the grouping of data by category, but most of the packages couldn't print just the groupings; the full column of data had to be printed out as well, with the group breaks at the end of each section.

While we found a wide range of extra features and flexible functionality among the nonprogrammable databases reviewed here, we also found them to be perfectly capable of handling the tasks for which they were designed. Choosing the right product requires both an assessment of your current database needs and a good guess as to how those needs may grow in the future. These database packages will more than suffice for the needs of a casual database user.

Alpha Four

by Joe Salemi

Alpha Four, Version 1.1, from Alpha Software Corp., justifies its \$549 price with power and flexibility and is one of the easiest nonprogrammable databases to set up. It's compatible with *dBASE* data files, it easily handled every one of our tests, and it has relational abilities that match those of *Personal R:BASE* and go well beyond those of the other packages.

DECEPTIVE INTERFACE

Alpha Four's character-based interface is old-fashioned compared with the interfaces used by some of the other products in this review; you can see only a menu of the functions and function keys available. Hiding behind this simple interface, however, is a complete environment for managing data in a single- or multiple-file structure.

When you start *Alpha Four*, it automatically loads the database that was in use when it was last run. You can view the data in either form or table mode and search for any record in the database using



EDITORS' CHOICE

- *Alpha Four*
- *Q&A*

Most of the nonprogrammable databases we tested can be used for the basics: generating mail-merge letters or mailing labels and maintaining inventory or client lists. If your needs are more extensive, though, you'll want a package that handles multiple data import formats, has lookup abilities, makes query creation easy, offers a variety of output options, and includes some simple applications development tools and security features.

For simplicity without restrictions, *Alpha Four* does the job well. Its interface isn't as flashy as some others, but it has a unique if-then-else mail-merge capability that makes it one of the most useful products for that task. It handled our most complex queries with ease and can access SQL database servers, making it one of the most expandable packages in this group.

Alpha Four has the edge in power, but *Q&A* has the edge in the interface department, with its Intelligent Assistant available to create plain-English queries. *Q&A*'s best features are its lookup abilities and excellent mail-merge and label-making capabilities. For overall usability, *Q&A* and *Alpha Four* are neck and neck.

Honorable mention goes to *Nutshell Plus II*, a good choice for making quick work of database chores. It was the best performer on PC Magazine Labs' tests and should be considered not only for its superior speed but for its full range of database management tools as well.

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DATABASES

NONPROGRAMMABLE



NONPROGRAMMABLE DATABASES: SUMMARY OF FEATURES

Products listed in ascending price order

	Clarion Personal Developer	File Express	PC-File	Personal R:BASE	Reflex	Professional File
List price	\$79 00	\$99 00	\$149 00	\$199 00	\$249 95	\$299 00
FILE STRUCTURE						
Maximum number of characters per field	64,000	1,000	254	4,096	254	Unlimited
Maximum number of fields per record	Unlimited	200	128	80	250	3,200
Maximum record size	64K	4K	4K	4K	8K	128K
Maximum number of records per data file	Unlimited	Unlimited	Unlimited	Unlimited	65,000	59,000
Maximum number of files per database	Unlimited	Unlimited	1	80	1	1
Filing system:						
dBASE III	☐	☐	☒	☒	☐	☐
dBASE IV	☐	☐	☒	☒	☐	☐
Proprietary	☒	☒	☐	☒	☒	☒
DATA TYPES						
Fixed-length characters	☒	☒	☒	☒	☒	☐
Variable-length characters	☐	☐	☒	☒	☒	☒
Currency	☒	☒	☒	☒	☒	☐
Integer	☒	☒	☒	☒	☒	☒
Fixed-point decimal	☒	☒	☒	☒	☒	☒
Floating-point decimal	☒	☒	☒	☒	☒	☒
Date	☒	☒	☒	☒	☒	☒
Time	☒	☒	☐	☒	☐	☒
Boolean	☐	☐	☒	☐	☐	☐
Calculated	☒	☒	☒	☒	☒	☒
FIELD ATTRIBUTES						
Range testing	☒	☐	☐	☒	☐	☒
Pattern testing	☒	☐	☒	☐	☐	☒
Default values	☒	☐	☒	☒	☒	☒
Specific values	☒	☒	☒	☒	☒	☒
External data file lookups	☒	☒	☒	☒	☐	☒
Double-entry verification	☒	☐	☐	☐	☐	☒
Rule-based verification	☐	☐	☐	☒	☐	☒
Fill field	☐	☒	☒	☒	☒	☐
Forced uppercase	☒	☒	☒	☒	☐	☒
Date conversions	☒	☒	☒	☒	☒	☒
Time conversions	☒	☒	☒	☒	☒	☒
Unique fields	☒	☐	☒	☒	☐	☒
IMPORT/EXPORT FORMATS						
ASCII (delimited)	☒	☒	☒	☒	☒	☒
ASCII (fixed-length)	☒	☒	☒	☒	☒	☒
.DB (Paradox)	☐	☐	☐	☐	☒	☐
.DBF	☒	☒	☒	☒	☒	☒
.DIF	☒	☒	☒	☒	☒	☐
.DOC (Microsoft Word)	☐	☐	☐	☐	☐	☐
PFS	☐	☐	☐	☒	☒	☒
.WKS or .WK1	☐	☒	☐	☒	☒	☒
.WP (WordPerfect)	☐	☒	☒	☐	☐	☐
XLS	☐	☐	☐	☐	☐	☐
User-defined	☐	☒	☒	☐	☐	☐
INDEXING						
Can turn index on and off	☐	☒	☐	☒	☒	☒
Can link multiple fields in one index	☒	☒	☐	☒	☒	☐
Can enforce unique values	☒	☒	☐	☒	☐	☒
Can respect indexed fields	☒	☒	☒	☒	☒	☒
Indexed values need not be unique	☒	☒	☒	☒	☒	☒

☒—Editors' Choice

☒—Yes

☐—No

N/A—Not applicable: The product does not have this feature.

DATABASES
NONPROGRAMMABLE

RapidFile	Nutshell Plus II	Q&A	Alpha Four
\$295.00	\$395.00	\$399.00	\$549.00
254 250 7.5K 64,000 1	15 million 60,000 Unlimited Unlimited Unlimited	32,000 2,045 64K Unlimited 1	256 128 4K Unlimited 10
☐ ☐ ■	☐ ☐ ■	☐ ☐ ■	■ ☐
☐ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■
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☐ ☐ ☐ ■ N/A	■ ■ ■ ■ ■	■ ■ ■ ■ ■	☐ ■ ■ ■ ■

CONTINUES

CONTINUES

Suitability to Task

Alpha Four

Data loading and access	1	1	3	1
Queries	1	1	3	1
Reports	1	1	3	1
Applications development	1	1	1	4

the Find command for indexed fields and the Locate command for unindexed fields. Search lists act as filters, displaying only the subset of data that meets the search criteria, and can be saved for repeated use.

The package supports a full range of columnar reports and mailing labels. The mail-merge function gives you the ability to create if-then-else constructs within a letter. This allows the contents of the letter to be different depending on the values contained in one or more of the fields in the database being merged.

Alpha Four can post data from the current data file to another one on-disk. It also supports the relational commands such as Join, Subtract, and Intersect, but the results of these commands are contained in a new database file. There's the inherent danger that the data in the resulting database will become out of sync with its parent database as it is updated, so these commands are much more appropriate for one-time data analysis than for constant use.

The Set functions are much more practical for creating dynamic links between different databases. Similar to a relational view, a Set lets you link up to ten databases on a common field, and mix and match the fields you want to display on the screen. A Set is treated like a single database, with the advantage of not having to duplicate data already contained in other files, and it supports all the reporting, labeling, and mail-merge functions.

PERFORMANCE VS. FUNCTIONALITY

Alpha Four wasn't a speed demon on PC Magazine Labs' performance tests, though it placed in the top half on most of them. The program handled all our tests with impressive ease, and we never had the need to contact technical support. If you need support, however, it is provided free

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DATABASES

NONPROGRAMMABLE

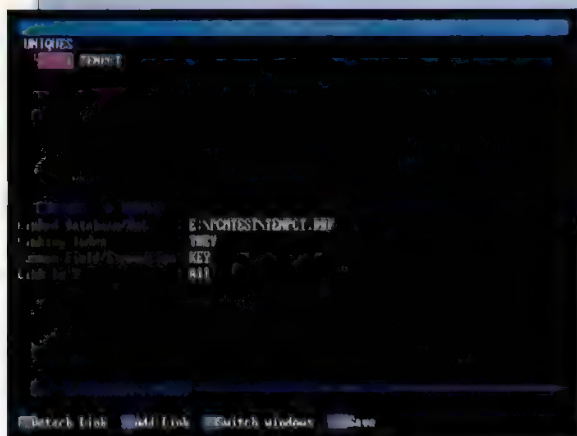
NONPROGRAMMABLE DATABASES: SUMMARY OF FEATURES

Products listed in ascending price order

	Clarion Personal Developer	File Express	PC-File	Personal R:BASE	Reflex	Professional File
INPUT FACILITIES						
Automatic data entry	☐	☒	☒	☒	☒	☒
Calculated fields on entry screen	☒	☒	☒	☒	☒	☒
Default entry screens	☐	☒	☒	☒	☒	☒
Default entry values	☐	☒	☒	☒	☒	☒
User-defnable entry screens	☒	☒	☒	☒	☒	☒
Multifile access	☒	☒	☐	☒	☐	☐
Multiple record updates	☒	☒	☒	☒	☒	☒
Multiple screens	☒	☒	☒	☒	☒	☒
Carryover value from previous record	☒	☒	☒	☒	☐	☒
Error handling	☒	☒	☒	☒	☒	☒
GRAPH FUNCTIONS						
Bar chart	☐	☐	☒	☐	☒	☐
Line graph	☐	☐	☒	☐	☒	☐
Pie chart	☐	☐	☒	☐	☒	☐
Scatter graph	☐	☐	☒	☐	☒	☐
Stacked bar chart	☐	☐	☒	☐	☒	☐
QUERY FACILITIES						
Query interface:						
Command line	☐	☒	☒	☒	☐	☐
Menu-driven	☐	☒	☒	☒	☐	☐
Query by form	☐	☒	☒	☒	☐	☐
Query by example	☐	☐	☒	☒	☒	☐
Multiple data file access	☒	☒	☒	☒	☐	☐
Stored queries	☒	☐	☐	☒	☐	☒
Applications generator	☒	☐	☐	☒	☐	☒
Macro or scripting language	☒	☒	☒	☐	☐	☒
Can record and play back keystrokes	☐	☒	☒	☐	☐	☒
SEARCH PARAMETERS						
First occurrence	☒	☒	☒	☒	☒	☒
All occurrences	☒	☒	☒	☒	☒	☒
Case-sensitive	☐	☐	☒	☒	☐	☒
Indexed fields only	☒	☐	☐	☒	☐	☐
Pattern searches	☐	☒	☒	☒	☒	☒
Phonetic searches	☐	☒	☒	☐	☐	☐
Range searches	☒	☒	☒	☒	☐	☐
Substring searches	☒	☒	☒	☒	☒	☐
Whole word searches	☒	☒	☒	☒	☒	☒
Wildcard searches	☐	☐	☒	☒	☒	☒
OUTPUT FACILITIES						
Report types:						
Columnar	☒	☒	☒	☒	☒	☒
Form-based (fixed-length)	☒	☒	☒	☒	☒	☒
Report definition:						
Multifile access	☒	☒	☒	☒	☐	☐
Break fields	☒	☒	☒	☒	☒	☒
Subtotals on breaks	☒	☒	☒	☒	☒	☒
Totals	☒	☒	☒	☒	☒	☒
Sorting:						
Descending sort	☐	☒	☒	☒	☒	☒
Sorts on compound fields	☒	☒	☒	☒	☒	☒
Sorts on index only	☒	☒	☐	☒	☐	☐
Maximum number of sorting levels	Unlimited	10	1	10	5	8
Can customize collating sequence	☐	☐	☒	☒	☒	☐
Printing:						
Supports PostScript	☐	☐	☒	☐	☒	☒
Can install fonts	☒	☐	☐	☐	☐	☐
Mail-merge (variable-length)	☒	☒	☒	☐	☒	☐
Mailing labels	☒	☒	☒	☒	☒	☒
HELP/TECHNICAL SUPPORT						
Context-sensitive on-line help	☒	☒	☒	☒	☒	☒
Bulletin board support	☒	☒	☒	☒	☒	☒

—Editors' Choice ☒—Yes ☐—No

DATABASES NONPROGRAMMABLE



Alpha Four's Set editor lets you transform views into multiple data files. The top half of the screen graphically portrays the relationships between the databases in the set, while the bottom half is used to describe them.

phone dialer, a crosstab view, password protection for databases, forms and reports, and the ability to have multiple database files open simultaneously. The interface will also have been updated to a character-mode graphics format, though the menu items will remain the same.

Alpha Four has a great combination of ease of use and power. It's simple enough for an inexperienced user and the most basic applications, yet it is perfectly capable of growing with you as your database management needs increase. It may very well be the only database package you'll ever need.

Clarion Personal Developer

by Greg Pastrick

In many ways, the \$79 *Clarion Personal Developer* from Clarion Software Corp. is mismatched with the other products in this evaluation. While it requires no programming with the *Clarion* language, or any other language for that matter, it requires some knowledge of programming principles. *Clarion* is not just a flat-file database program but rather a database applications generator that borrows selectively from the functions and concepts found in the full-blown *Clarion Professional Developer*.

The software does the programming by letting you build menus, tables, forms, and reports from the database definition files you create and index to a primary key. The imposed structure of the program's approach to creating usable data-

bases may be a blessing or a curse, depending on your needs and what you wish to accomplish.

CANNED APPLICATIONS

Straight out of the box, *Clarion* comes with a selection of fully functional general applications that act as examples of what you can do with the software. These applications include home inventory, club membership, personal library, memos, order entry, Rolodex, classroom management, and sales-tracking databases. Each one highlights some of the primary functions and features of the program, including computed and conditional fields, record filters and selectors, and lookup fields. All are used in building menus, tables, forms, and reports—the basic elements of *Clarion* applications. The canned applications are completely editable, so you can fine-tune them to your specifications by selecting the Modify option from the main menu.

There are two ways to create databases with *Clarion*: the highly limited Quick

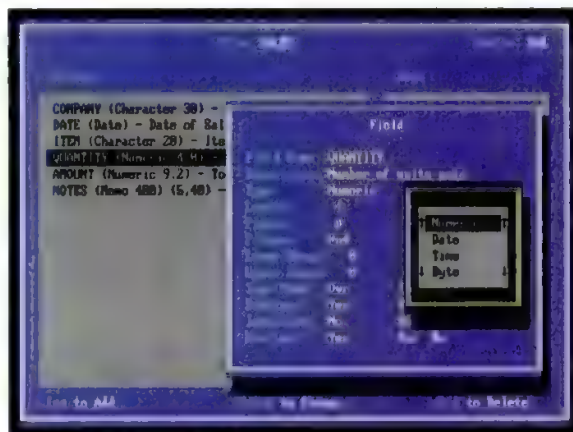
Start function or the regular database applications builder. *Clarion's* interface is *Microsoft Windows*-based, as are the applications you build, and since the emphasis is on creating applications, the program has good design capabilities, including windows sizing and screen-attribute and color modifications. The number and kinds of screens you have to navigate through to alter or create applications can be intimidating, but it's just part of the imposed structure of the program. The package really needs mouse support, and Clarion Software Corp. recommends a third-party product called *Mouse Trap* from Eckenrodd Associates (800-950-5058).

APPLICATION DESIGN

The most basic elements of a *Clarion* application are files and procedures. All procedures such as menus, tables, forms, and reports are linked to and built from the files containing defined data fields. Similarly, file summary screens and applications summary screens are the essential work areas for building an application. In the file summary screen you name fields, assign data types and characteristics to the fields, and enter a primary sort key to the file you create.

All selections and information related to the field definition are entered through an options window. There's a 14-character limit to numeric fields, but the product specifies many data types and characteristics, including user-definable masks for data validation criteria. Expanding or removing sort keys simply requires inserting or deleting key names, linked to a data field through an options window.

The applications summary screen is where you assign tasks or procedures linked to the files created. As you build menus, tables, forms, and



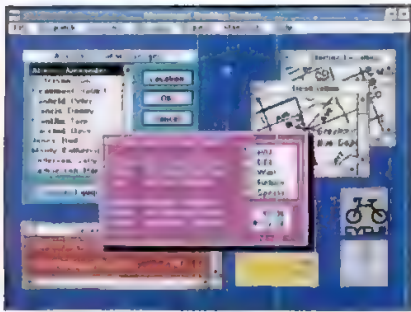
Clarion Personal Developer applications are built on two key elements: files and procedures. Here, a database file is constructed on the program's file summary screen by entering field names and by popping the field definition box on-screen.

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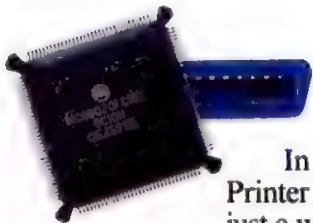
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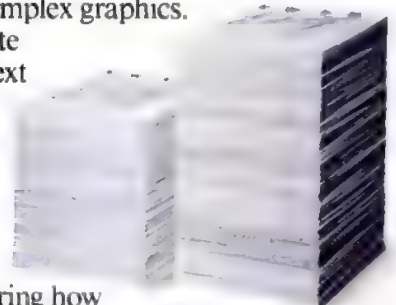
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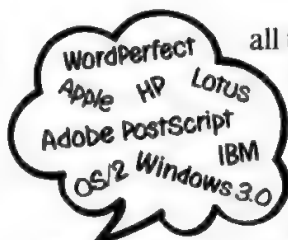
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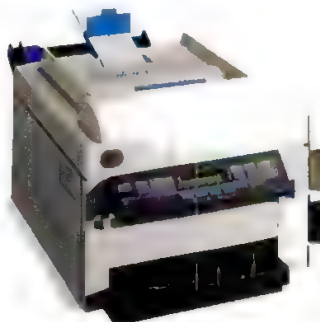


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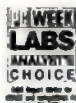
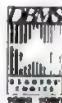
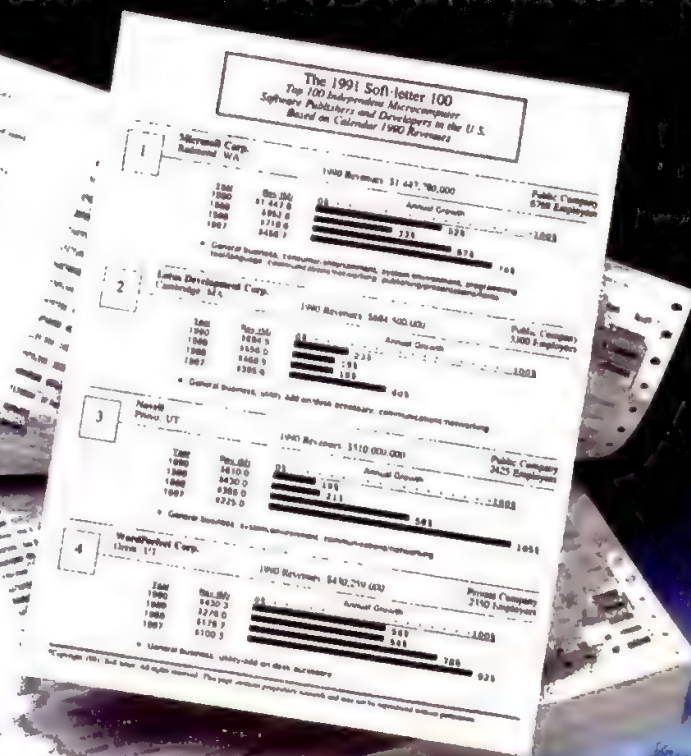
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PERFORMANCE TESTS: NONPROGRAMMABLE DATABASES

No one database excelled on all of PC Magazine Labs' tests, which are represented in the five charts that appear on the following pages. On the two Load and Index tests, there was a virtual tie among *Alpha Four*, *Professional File*, *RapidFile*, and *Reflex*. *Nutshell Plus II* performed the best in selecting and updating records, *RapidFile* was the leader in reporting, and *Q&A* did the fastest sorts.

HOW WE TESTED THE DATABASES

For our tests, we used two databases containing two tables each. The small database contained 1,000 rows per table and the large database contained 10,000 rows per table. The database schema was identical for both tables (see Figure 1). Except where noted, the data was imported from fixed-length ASCII files and converted to the native file format of the database package. We provided comma-delimited and .DBF formats for products that did not support fixed-length ASCII files.

We tested the databases on 25-MHz Compaq Deskpro 386/25s with 300MB hard disks and 4MB of extended RAM. Each hard disk was formatted as two 150MB disks under Compaq DOS 4.01. DOS and the test files were stored on the C: drive, and the system under test was installed on the D: drive. SHARE.EXE was loaded, and the CONFIG.SYS and AUTO-EXEC.BAT files were provided by the

vendors. Disk caches were not permitted unless they were included in the database package. (All test scores that fall below 1 second are expressed as < 00:01.)

WHAT THE NUMBERS MEAN

When comparing times for the Load and Index test, keep in mind that some packages automatically index certain fields while loading records. *Clarion Personal Developer* and *PC-File* automatically index the primary key, and *Nutshell Plus II* indexes every field. *Nutshell Plus*'s performance is particularly impressive because its load time actually reflects the time it takes to load the data and build 12 indexes. On the 1,000-record database, it finished before *Q&A* and *File Express*, which generated one-fourth as many indexes.

File Express, *Personal R:BASE*, and *Q&A* were much more efficient at indexing redundant data than the other products. The indexing times for the CODE and NAME fields indicate that most packages took at least as much time to index NAME, a 20-character field with 90 percent redundancy, as CODE, a 10-character field with no redundant values. On the 10,000-record database, *Q&A* indexed NAME in about half the time it took for CODE. *File Express* indexed NAME in 38 percent of the time, and *Personal R:BASE* indexed NAME in only 7 percent of the time.

The results of the 1,000-record database Select test are not shown because most of the packages could retrieve the 100 selected records in under 5 seconds. The exceptions, *File Express* and *PC-File*, took 20 seconds. On the 10,000-record Select test, *File Express* and *PC-File* took over 3 minutes to retrieve 1,000 records,

while most others took under 30 seconds.

On the Update tests, *Nutshell Plus* outperformed all of the others on the global search-and-replace, taking less than 2 seconds to modify 1,000 keys in the 10,000-record database. *Professional File* took the longest, at 8 minutes.

On the global search and delete, *RapidFile* and *Reflex* led the pack, with *Q&A* falling a distant third. *Nutshell Plus* took considerably longer to delete records than to modify a field, since deleting a record in *Nutshell Plus* forces updates to as many indexes as there are fields. All of the other products updated only 2 indexes, but *Nutshell Plus* updated 12. *Clarion Personal Developer* could not perform the bulk-delete operation since it has no facilities for global deletion, and *Personal R:BASE* has no global update capabilities at all.

On the Report test, *RapidFile* performed exceptionally well, joining two tables and formatting and outputting the columnar report in less than 20 seconds for the 1,000-record report and just under 5 minutes for the 10,000-record report. *File Express* and *Reflex* could not join tables on common field values and consequently could not generate the report.

Except for *File Express* (which took about 56 seconds), all programs performed the 1,000-record Sort test in less than 8 seconds, so we are not showing the results. On the 10,000-record sort, *File Express* was once again the straggler, with *Nutshell Plus* falling in second-to-last place. Since every field is inverted, *Nutshell Plus* relies entirely on indexing, and apparently it is not optimized for sorting in descending order. *Clarion Personal Developer* cannot sort on unindexed fields and cannot index in descending order.

CONTINUES

Figure 1: Database Structure and Data Ranges

Field	Data	Data range/length	Unique
KEY	Integer	0 to 1 billion	■
INT	Integer	0 to 1 billion	□
SIGNED	Integer	-1 billion to 1 billion	■
FLOAT	Single-precision floating-point	-1.2 billion to 1.2 billion	□
DOUBLE	Double-precision	-1.2 billion to 1.2 billion floating-point	□
DECIM	Fixed-decimal	-1 billion to 1 billion (0.00)	□
DATE	Date	01/01/1900 to 12/01/2000	□
CODE	Fixed-character	10 alphanumeric characters	■
NAME	Fixed-character	20 alphanumeric characters	□
ADDRESS	Variable-character	2 to 80 alphanumeric characters	□
FILL	Fixed-character	6 characters	□

■—Yes □—No

reports from the field definition files, the screen begins to take on the appearance of an outline, which is visually complex but an easy way to focus on procedures you want to modify or expand on later. Within each procedure you further define and name the items associated with each task. To design specific reports linked to records structured by the definition files, you enter and define elements of those procedures from an options window that pops up from Ctrl-key combinations.

Querying with *Clarion* is difficult because queries must be built as applications. There is little data that you can search for on the fly.

Since views of data are independent of the database files, you can effectively mix

DATABASES NONPROGRAMMABLE

and match lookup and computed fields linked to those files based on arithmetic expressions or formulas for updating and printing records. Modifications to files or procedures from anywhere in the program are always saved by hitting Ctrl-Enter, and each time you rerun an application from the main menu it compiles, resorts, or reindexes itself.

CLARION CONVERSION

Performance on our speed tests showed *Clarion* to be fairly fast in handling re-

Clarion Personal

**Developer proved to
be fast in handling
reporting tasks.**

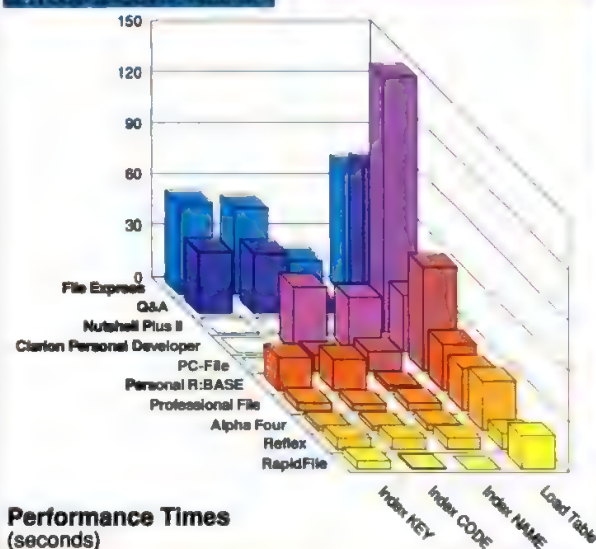
porting tasks. The program pays a time penalty in loading databases, since it converts them to *Clarion* format, but not enough to call it inefficient. *Clarion* was unable to manage the descending sort or global delete tests, and a bug turned up when we attempted to enter an 80-character memo field on a procedure screen.

Code errors occur when fields are placed in the first or last column of the procedure screen. This is not normally a problem, because when you open a screen to its full width, the columns are occupied

PERFORMANCE TESTS: NONPROGRAMMABLE DATABASES

LOAD AND INDEX

1,000-Record Tables



The **Load and Index** tests measure how quickly a database package loads and indexes a two-table database. In addition to showing the efficiency of the import routine, the test shows how data types and redundancy affect indexing performance.

Except where noted, the databases import fixed-length ASCII files. Two indexes were built into each table, and

in both tables, the primary key index was built on the integer **KEY** field. In the first table, we built a secondary key index on the alphanumeric **CODE** field, and in the second table, we indexed the alphanumeric **NAME** field. All of the values in **KEY** and **CODE** were unique; they occurred only once for the field in the entire database. Only 10 percent of the values in the **NAME** field were unique.

1,000-Record Tables

Elapsed Time (hours:minutes:seconds)

	Load Table	Index KEY	Index CODE	Index NAME	Total Load and Index Time
RapidFile	00:00:20	00:00:05	00:00:01	00:00:00	00:00:26
Reflex	00:00:10(a)	00:00:07	00:00:07	00:00:07	00:00:31
Alpha Four	00:00:29	00:00:03	00:00:03	00:00:04	00:00:39
Professional File	00:00:25	00:00:05	00:00:04	00:00:05	00:00:39
Personal R:BASE	00:00:28	00:00:20	00:00:19	00:00:03	00:01:10
PC-File	00:01:02	(b)	00:00:10	00:00:12	00:01:24
Clarion Personal Developer	00:00:34	(b)	00:00:39	00:00:33	00:01:46
Nutshell Plus II	00:02:30(c)	(b)	(b)	(b)	00:02:30
Q&A	00:01:26	00:00:36	00:00:35	00:00:04	00:02:41
File Express	00:01:13	00:00:52	00:00:49	00:00:19	00:03:13

10,000-Record Tables

Elapsed Time (hours:minutes:seconds)

	Load Table	Index KEY	Index CODE	Load NAME	Total Load and Index Time
RapidFile	00:03:45	00:01:07	00:00:54	00:00:55	00:06:41
Reflex	00:01:31(a)	00:01:15	00:01:07	00:01:24	00:05:17
Alpha Four	00:04:51	00:00:48	00:00:43	00:00:57	00:07:19
Professional File	00:04:26	00:00:49	00:00:56	00:00:50	00:07:01
Personal R:BASE	00:04:57	00:05:18	00:05:24	00:00:24	00:16:03
PC-File	00:11:17	(b)	00:01:22	00:01:28	00:14:07
Clarion Personal Developer	00:06:49	(b)	00:01:49	00:02:39	00:11:17
Nutshell Plus II	01:29:52(c)	(b)	(b)	(b)	01:29:52
Q&A	00:11:53	00:08:09	00:08:19	00:04:24	00:32:45
File Express	00:12:24	00:14:13	00:14:21	00:05:27	00:46:25

(a)—The file was imported in .DBF format.

(b)—The time for building this index is included in the Load test.

(c)—The product automatically indexed all defined fields during the Load test.

CONTINUES

IMAGINE

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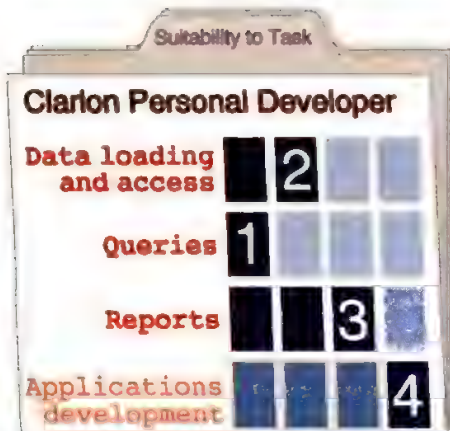
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by an erasable border by default. But if you want to place an 80-character field on-screen, it has to be *pictured* or specified as something less than 80 characters so that the extra characters will wrap around.

The price of the program has been reduced to half of last year's cost. If that's not enough of an enticement, Clarion Software Corp. offers the "Desktop Solutions Club" to registered users, which is a promotion designed to provide six additional database programs including checkbook, personnel management, project management, time management, stock part tracking, and car maintenance log appli-

cations for use with *Clarion*.

Though the program includes context-sensitive help screens, *Clarion Personal Developer* is not an especially easy program for casual users to master, especially since query setup can be difficult. Nevertheless, it does make good-looking, usable database applications, and on that account it is hard to fault the program. It's well worth the bargain price.

File Express

by Greg Pastrick

Touted by Expressware Corp. as a major upgrade to its previous version, *File Express*, Version 5.0 (\$99), is a logically structured and easily accessible package for users with little or no database management experience.

Foremost on the list of improvements made to *File Express* is a new interface that employs numbered multilevel screens to launch users into standard database management functions, an effective method obviously directed toward part-time database users. For example, to execute a search-and-replace, you simply select Find/Edit Records from the main menu, then choose Search and Replace from the next screen. From this point, you're presented with a record selection screen loaded with search criteria examples, a window listing the defined fields of the database being searched, and an entry line labeled "Replace all the records where..."

Once the criteria have been entered and the search executed, a new screen listing the field names with a prompt to



File Express, Version 5.0

Expressware Corp., P.O. Box 1800, Duvall, WA 98019; 800-753-3453.

List Price: \$99.

Requires: 512K RAM, 1MB hard disk space, DOS 2.0 or later.

In Short: *File Express* has strong query and reporting functions, and its direct, easy entry interface makes it a good introduction to database management for novices. However, the program has some inherent limitations and slow performance on large record sizes.

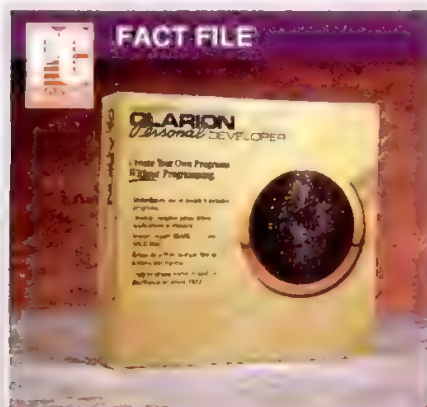
CIRCLE 306 ON READER SERVICE CARD

identify which field to replace appears. You enter the replacement at the line labeled "Replace [field name] with," and the program finds the first occurrence and asks permission to replace all records.

QUICK LAUNCHING

Like record searching, other standard database features are quickly launched from the main menu. General database upkeep procedures such as altering field definitions, changing the database specs, designing and using alternative data views, globally recalculating the database, and modifying printer definition files may also be accessed from the main menu's Maintenance option.

Version 5.0 also emphasizes reporting and output: There are nearly



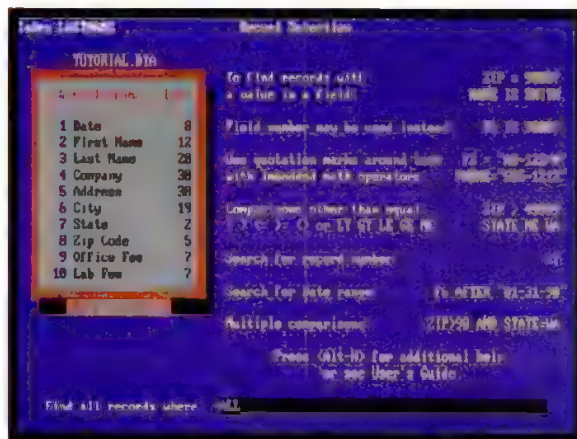
Clarion Personal Developer, Version 2.0
Clarion Software Corp., 150 E. Sample Rd.,
Pompano Beach, FL 33064; 800-354-5444,
305-785-4555.

List Price: \$79.

Requires: 512K RAM, 2MB hard disk space,
DOS 2.0 or later.

In Short: To use *Clarion Personal Developer* you need to have some knowledge of programming concepts. Since it's primarily an applications builder, the program's focus and the operations used to perform common database management tasks may be beyond the reach of inexperienced database users. The price is a bargain, and the applications supplied with *Clarion* are instructive.

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One of the virtues of *File Express* is its fast and easily accessible query functions used for finding and replacing user-specified records. The query screens are supported by a listing of the active database's field names.

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Suitability to Task									
File Express									
Data loading and access	■	■	2	■	■	■	■	■	■
Queries	■	■	■	■	■	■	■	4	■
Reports	■	■	■	■	■	■	■	3	■
Applications development	■	■	■	■	■	■	■	2	■

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File Express's import/export capabilities support a good range of formats, including standard mail-merge, *WordPerfect*, .DIF, .WK*, and .DBF files. A bug in the program prevents accurate loading of *dBASE III* files, however. All *dBASE III* import fields are shifted one character to the right when ported to a *File Express* definition file. Though *dBASE III* files were not required for our tests, they were tried when fixed-length ASCII files failed to load as expected. We settled on comma-delimited ASCII text files for testing.

Additionally, the program has a restrictive selection of data types for specifying data fields. They include character, numeric, increment, date, and formula fields. Unlike other programs that allow specification of numeric fields for floating-point values, 2- and 4-byte integers, or currency and time fields, *File Express* forces you to rely on a display-only format and user-defined mask fields to fill in the gaps. Numeric fields are restricted to 14 characters.

On the other hand, the program offers a good range of advanced formula functions (like *FUTUREDATE*), statements, and operators. True to its strong record-searching features, the program includes a phonetic operator called *SOUNDS LIKE*.

AVERAGE PERFORMANCE

File Express's performance on the various speed tests was not especially fast, particularly when dealing with a 10,000-record database. Though the program performed most of the tasks required for our evaluation, it was unable to manage the File Join in creating our columnar

DATABASES NONPROGRAMMABLE

report. *File Express* has the capability to specify file lookups on matching fields but could not read the joined values. The test routine was aborted after 1 hour had passed while it attempted to perform the operation on the 1,000-record database.

According to an Expressware Corp. representative, a supplemental release of the program is now available to registered users for a \$5 to \$10 upgrade charge. It will accommodate the addition of an auto-dialer and incremental values to the program. Version 6.0 is currently in the works, but no release date has been set.

Given its interface and sound search and reporting functions, *File Express*, Version 5.0, is an easy introduction to database management. For now, that's the role it plays best.

Nutshell Plus II

by Greg Pastrick

The database is the index, the index is the database. That's the philosophy behind Iris Software Products' \$395 *Nutshell Plus II*, Version 2.0, and it's a philosophy that yields amazingly fast sort, scan, and report times on PC Magazine Labs' tests by inverting data and creating indexes on every field of every record in the database.

The program is also loaded with a full range of sophisticated database management tools and improvements, including flexible macro functions, scrolling database layouts and alternative views, multiple field linking, file lookups, a selection of data validation criteria, Clipboard copy-and-paste functions, extended search criteria, and layout partitioning for advanced



FACT FILE

Nutshell Plus II, Version 2.0
 Ins Software Products, P.O. Box 57,
 Stoughton, MA 02072; 800-582-4747, 617-341-1990.
List Price: \$395.
Requires: 384K RAM, 360K hard disk space, DOS 2.0 or later.
In Short: *Nutshell Plus II* is a fast, high-powered relational database that owes its speed and efficiency to its use of inverted data and indexing on all fields of all records.

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data display and printing.

Some of the flexibility of the program is revealed when you first see it. Menu options are arrayed across the bottom of the screen, and the program is organized on a single basic Browse screen, which interacts with nine menu option screens. The key to navigation in *Nutshell Plus* is Alt-key combinations from the first screen on. Ctrl-key combinations are generally reserved for macros.

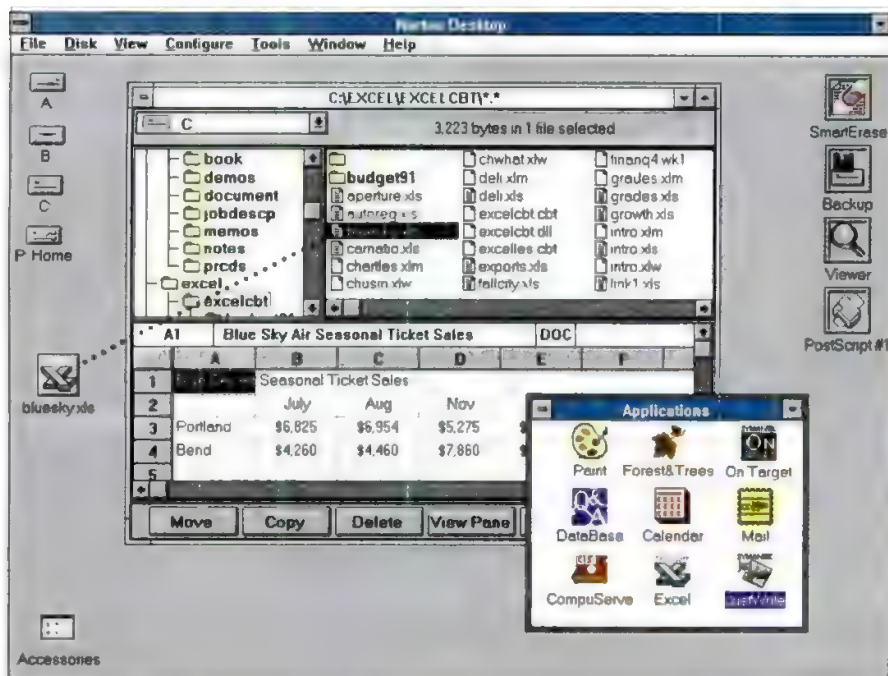
EASY START-UP

Starting a database with *Nutshell Plus* is as easy as typing a filename on the opening screen, selecting Define from the menu, and entering a list of field names to be specified. The program offers some unique data types, including



Here, a primary sort on a key field in *Nutshell Plus II* is defined for ascending order with a menu option for linking sorted fields at the bottom of the screen.

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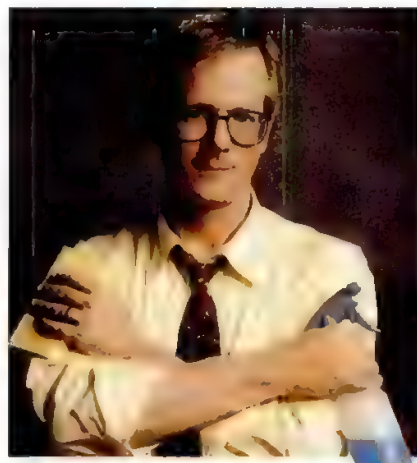
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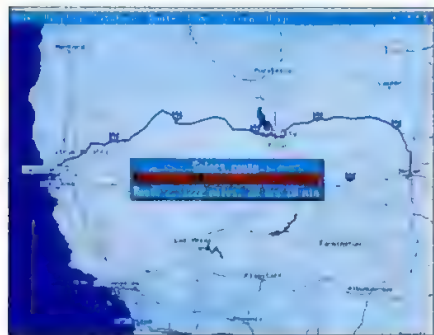
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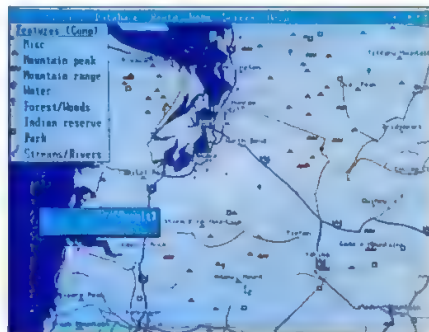
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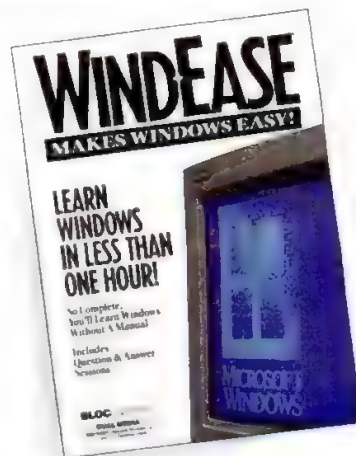
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- Program Manager
- File Manager
- Print Manager
- Write
- Terminal
- Paintbrush
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summary and time field definitions, and numeric fields allow the mixing of text and numbers while retaining the capability to perform calculations and summaries on the mixed fields.

There is virtually no limit to the size of number fields (they can hold up to 100 digits), though field sizes may be specified and formatted in the definition or shaped and altered on the fly on the layout screen.

Summary fields are reserved for totals, averages, and counts on field values for all records in a database file, while calcula-

tion fields automatically record the results of formulas based on selected record fields in the database. Formulas in *Nutshell Plus* are limited to a maximum of 250 characters per field.

The program's speed is really apparent when finding records. Since indexes exist for all fields, retrieval of selected information is close to instantaneous. Sorting takes a bit more processing time, since all fields are being reindexed to the specifications of the sort criteria. As PC Maga-

zine Labs' performance tests show, *Nutshell Plus*, which finished first in the Select test and in the modification part of the Update test, is efficient in handling data under a variety of conditions.

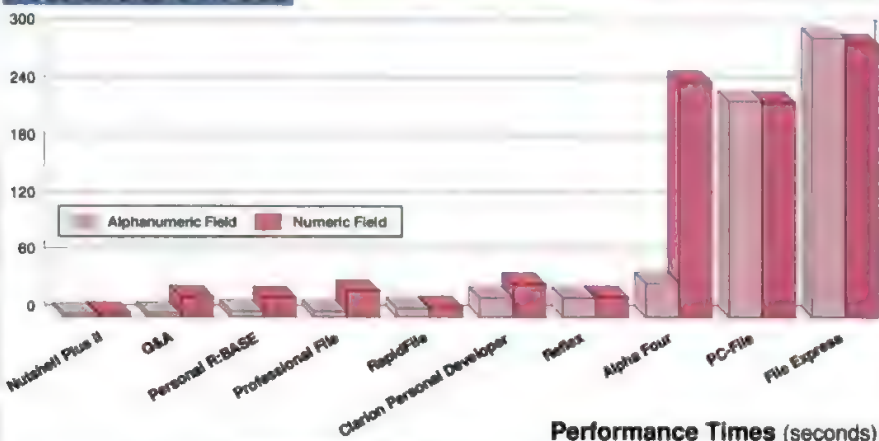
DATA-LOADING TRADE-OFF

Nowhere is its methodical inversion of data and field indexing more apparent than in the loading of our 10,000-record database. In one instance the test file took nearly 1 hour 45 minutes to load. Still, the payoff for the time penalty in importing is superb performance on the most compli-

PERFORMANCE TESTS: NONPROGRAMMABLE DATABASES

SELECT

10,000-Record Tables



The **Select** tests measure how long it takes to retrieve records based on indexed selection criteria. Selection speed depends on the storage organization and the number of selected records. To test storage organization, we ran queries on two types of indexes.

The first query was based on a numeric field with unique values. The second query was based on an alphanumeric field with redundant values. Both queries retrieved 10 percent of the records in a table.

10,000-Record Tables

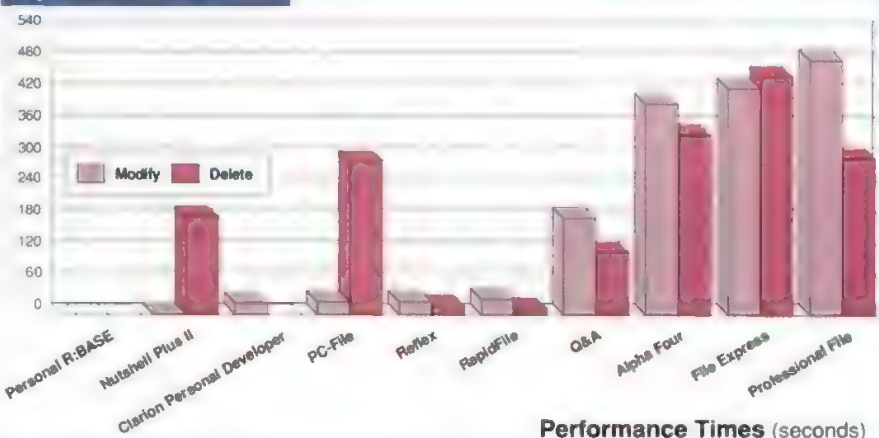
Elapsed Time (minutes:seconds)

	Alphanumeric Field	Numeric Field
Nutshell Plus II	00:03	00:04
Q&A	00:04	00:21
Personal R:BASE	00:06	00:20
Professional File	00:06	00:27
RapidFile	00:09	00:10
Clarion Personal Developer	00:20	00:34
Reflex	00:20	00:21
Alpha Four	00:35	04:07
PC-File	03:47	03:46
File Express	04:52	04:46

PERFORMANCE TESTS: NONPROGRAMMABLE DATABASES

UPDATE

10,000-Record Tables



The **Update** tests measure how long it takes the database to modify and delete records based on indexed selection criteria. First, we selected 10 percent of the records and globally re-

placed the primary key value using a formula that subtracted 1,000,000 from the original value. Then we reselected the updated records and deleted them.

10,000-Record Tables

Elapsed Time (minutes:seconds)

	Modify	Delete
Personal R:BASE	N/A	N/A
Nutshell Plus II	< 00:01	03:06
Clarion Personal Developer	00:22	N/A
PC-File	00:24	04:53
Reflex	00:24	00:17
RapidFile	00:29	00:12
Q&A	03:03	02:00
Alpha Four	06:42	05:44
File Express	07:11	07:33
Professional File	08:04	04:56

N/A—Not applicable: The product could not perform this test.

CONTINUES

Compudyne Notebooks

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- ▼ External monitor and keyboard ports
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Std. Memory	2 MB	1 MB	2 MB	2 MB
Max. Memory	16 MB	1 MB	6 MB	16 MB
CPU Cache	none	none	none	none
Hard Drive	40 MB IDE	20 MB IDE	30 MB IDE	60 MB IDE
I/O Ports	2 serial 1 parallel/ monitor, keyboard	1 serial 1 parallel/ monitor	1 serial 1 parallel/ monitor, keyboard	2 serial 1 parallel/ monitor, keyboard
Screen	9" 16 grey	10" 16 grey	10" 32 grey	9" 16 grey
Software	MS-DOS 5.0	none	MS-DOS 4.01	MS-DOS 5.0
Weight	6.5 lbs.	7 lbs.	6 lbs.	6.5 lbs.
Price	\$1499	\$1995	\$1995	\$1699

	ZEOS 386SX-20	Northgate 386SX 20	Compudyne NB5L/20	Zenith Mastersport 386SL
CPU	Intel386SX 20 MHz	Intel386SX 20 MHz	Intel386SL 20 MHz	Intel386SL 20 MHz
Std. Memory	1 MB	1 MB	2 MB	2 MB
Max. Memory	5 MB	5 MB	8 MB	8 MB
CPU Cache	none	none	64 K	64 K
Hard Drive	20 MB IDE	40 MB IDE	60 MB IDE	60 MB IDE
I/O Ports	1 serial 1 parallel/ monitor	2 serial 1 parallel/ monitor/keyboard	2 serial 1 parallel/ monitor/keyboard	1 serial 1 parallel/ monitor/keyboard
Screen	10" 16 grey	8.5" 32 grey	10" 64 grey	9" 32 grey
Software	none	MS-DOS 5.0	MS-DOS 5.0	MS-DOS 4.01
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Price	\$2295	\$2799	\$2199	\$4999



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VGA Color, 40 MB HD

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CIRCLE 132 ON READER SERVICE CARD





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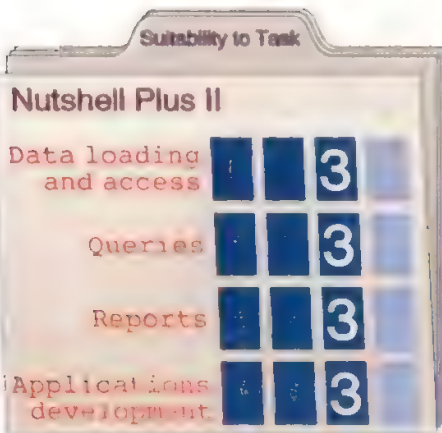
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CIRCLE 102 ON READER SERVICE CARD

DATABASES

NONPROGRAMMABLE



cated tasks, including creating views with linked fields, conducting file lookups, printing columnar reports, and performing global search-and-replace. Searching showed off the strength of the macro scripting functions of *Nutshell Plus*, since updates and deletes had to be executed as a series of operations to produce the desired result. Recording and playback of macro

scripts are easily accomplished from the command line and saved to user-defined hotkeys.

The program has a number of extras that add value to an already loaded program. A cousin of the Macintosh-based *FileMaker*, *Nutshell Plus* is compatible with comma-delimited ASCII, .DBF, .DIF, and mail-merge formats. Tab-delimited *FileMaker* files can be imported directly across platforms from the Mac-based database application. The documentation is well-designed, organized, and attractively presented. The on-line help screens provide page references to the manual. To round out these features, two utilities to compress and reconstruct damaged *Nutshell Plus* files are included.

There's really very little to complain about in *Nutshell Plus II*. It's a fast, full-featured database manager. The efficient data handling of this product marks it as a truly capable database management tool.

PC-File

by Joe Salemi

One of the premier shareware databases, *PC-File*, Version 6.0, is the second commercial release of ButtonWare's flagship product. Priced at \$149, it's designed to answer the needs of casual database users and users who need to maintain mailing lists and mail-merge letters. The interface has been completely redesigned, with improved ease of use, but it also has some rough edges that may frustrate both current and new users.

DUAL-MODE GRAPHICS

PC-File's new interface can run either in full graphics mode (on EGA-, VGA-, or Hercules-equipped systems) or in a similar character-based graphics mode. The mode is determined during installation, but it can be changed through a configuration or command line option. In both modes, you're presented with an interface

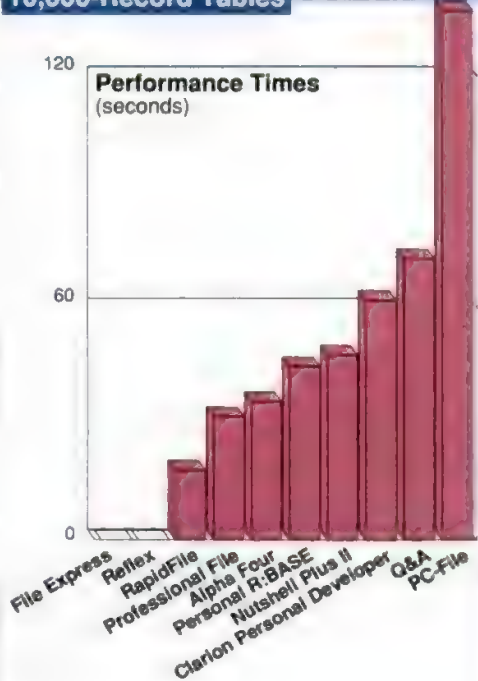
PERFORMANCE TESTS: NONPROGRAMMABLE DATABASES

REPORT

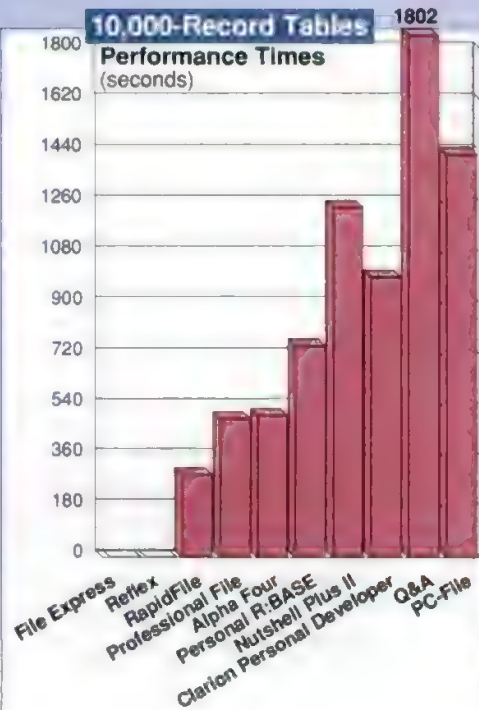
The **Report** test shows how long it takes the package to generate a standard columnar report based on data joined from two tables. The report includes the following tasks: join two tables based on a common key value,

select two fields from the first table and two fields from the second table, sort one field in ascending order, at breakpoints calculate subtotals for two numeric fields and print grand totals at the end, and send the results to a print file.

10,000-Record Tables



10,000-Record Tables



1,000-Record Tables

Elapsed Time (minutes:seconds)

File Express	N/A
Reflex	N/A
RapidFile	00:18
Professional File	00:32
Alpha Four	00:36
Personal R:BASE	00:45
Nutshell Plus II	00:48
Clarion Personal Developer	01:02
Q&A	01:13
PC-File	02:17

10,000-Record Tables

Elapsed Time (minutes:seconds)

File Express	N/A
Reflex	N/A
RapidFile	04:52
Professional File	08:14
Alpha Four	08:24
Personal R:BASE	12:31
Nutshell Plus II	20:42
Clarion Personal Developer	16:36
Q&A	30:02
PC-File	23:50

N/A—Not applicable: The product could not perform this test.

CONTINUES

DATABASES NONPROGRAMMABLE



PC-File, Version 6.0
 ButtonWare Inc., 325 118th Ave. SE, #200,
 Bellevue, WA 98005; 800-528-8866, 206-454-
 0479.
List Price: \$149; upgrade from previous
 versions, \$49; network version, \$379.95.
Requires: 450K RAM, 1MB hard disk space,
 DOS 3.1 or later.
In Short: Even with a friendly graphical
 interface design for new database users, *PC-File*
 has some rough edges and problems that
 all users may find frustrating.

CIRCLE 400 ON READER SERVICE CARD

to-run applications. Return your registration card and you can choose two free applications; others cost under \$25. The Tools menu accesses an auto-dialer (so you can dial phone numbers directly from the database), a calculator, and the ability to print a *snapshot* mailing label for the record displayed on-screen.

ROUGH EDGES

PC-File performed adequately on PC Magazine Labs' tests, but we ran into a number of quirks. The first was a problem with indexing. *PC-File* required that at least one field be indexed, and it built the index after the test data was imported. Upon opening the database, we received an error message stating that the index was invalid, so we had to rebuild it. Later, we were dumped out to the DOS prompt when another test was completed, and the index was again corrupted.

ButtonWare is aware of some indexing problems and is working on correcting them. The company is willing to ship bug fixes and maintenance releases free of charge to registered customers. Unfortunately, after the initial free 30-day support period, you can get support only through a 900 number (\$2 per minute, with the first minute free), through its bulletin board, or through CompuServe.

We found another quirk during testing when we changed the structure of a database (dropping one of the initial fields). *PC-File* insisted on creating a whole new database instead of simply changing the existing one.

The new database also had to be reindexed since it could not use the index files from the parent. This can cause problems if you have a number of lookups in other databases that refer to the

Suitability to Task	
PC-File	
Data loading and access	2
Queries	3
Reports	3
Applications development	2

redesigned one. You have to remember either to go back and edit the references in the other databases or to exit to DOS and rename the new database file to match the one it replaced.

The mail-merge and mailing-label functions worked well, though the reports and mail-merge sometimes failed to put form-feeds between pages. Curiously, some of the database maintenance functions like the packing module are external character-mode utilities that *PC-File* shells out to DOS to run.

Casual database users and those with very light database needs will be satisfied with *PC-File*, Version 6.0, but its problems and quirks may frustrate some new users.

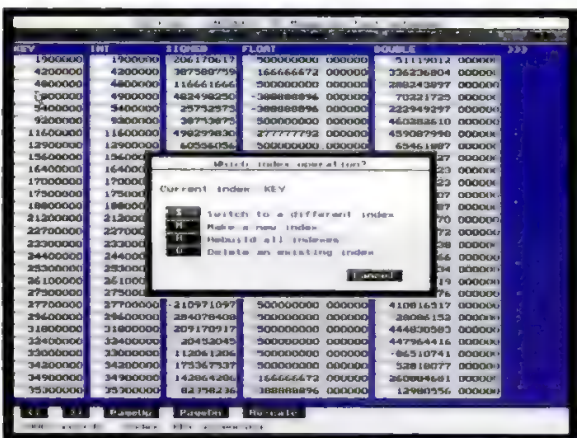
Personal R:BASE

by Joe Salemi

Personal R:BASE, Version 1.0, is a stripped-down version of Microrim's relational database package *R:BASE*. While it shares many features with its big brother, this \$199 package also has some limitations. It's the most relational of the databases in this review, yet it's incapable of doing some of the basic tasks that other packages handled with ease. It's designed more as a portable version of *R:BASE* than as a nonprogrammable database in itself.

FAMILIAR INTERFACE

Personal R:BASE has the same interface and menus as *R:BASE*, Version 3.1, including the excellent query-by-example (QBE) interface, pull-down and pop-up menus, check boxes, and forms and reports generators. What's missing is *R:BASE*'s programming interface: There



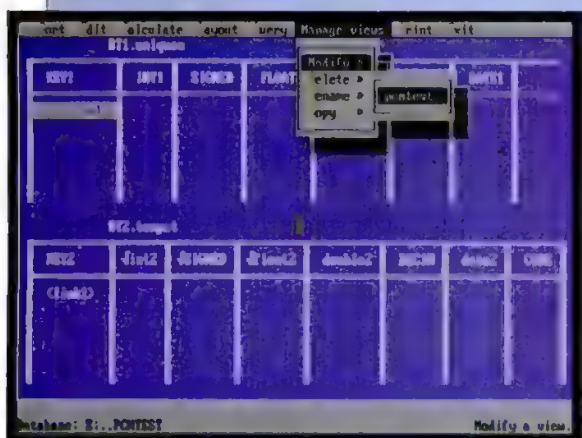
KEY	INT	SIGNED	FLONT	DOUBLE
1900000	1900000	206170617	500000000 000000	5117012 000000
4200000	4200000	387589795	166666672 000000	336236804 000000
4800000	4800000	116461666	500000000 000000	388243997 000000
7000000	4900000	482498250	-388888896 000000	70321725 000000
2400000	3400000	25732573	-388888896 000000	222949297 000000
9200000	9200000	38713675	500000000 000000	460383610 000000
11600000	11600000	496229832	377777792 000000	659087990 000000
12900000	12900000	60558054	500000000 000000	65461887 000000
15600000	15600000			27 000000
16400000	16400000			23 000000
17000000	1700000			22 000000
17500000	1750000			27 000000
18800000	1880000			27 000000
21200000	2120000			70 000000
22700000	2270000			72 000000
22300000	2230000			28 000000
24400000	2440000			56 000000
25300000	2530000			34 000000
26100000	2610000			19 000000
27500000	2750000			76 000000
27700000	27700000	-210971097	500000000 000000	410816537 000000
29600000	29600000	284078408	500000000 000000	38086153 000000
31800000	31800000	209170917	500000000 000000	444820583 000000
32400000	32400000	20453045	500000000 000000	447964416 000000
33000000	33000000	112881286	500000000 000000	-86510741 000000
34200000	34200000	175367537	500000000 000000	52818077 000000
34900000	34900000	142664266	166666672 000000	26084691 000000
75300000	75300000	82758236	388888896 000000	12980556 000000

ButtonWare has made *PC-File*, Version 6.0, easier to use with a graphics-based interface containing pull-down and pop-up menus, radio buttons, and mouse support.

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DATABASES

NONPROGRAMMABLE



Query-by-example is one of the most powerful features of *Personal R:BASE*. Using a combination of pull-down menus and selection boxes, you can quickly create a multitable view that can be saved for repeated use.

is no "R>" prompt or "prompt-by-example" mode, and RBEDIT (the programming editor) and all of the powerful multiuser and transaction-processing capabilities of its higher-end sibling have been removed.

Unfortunately, many of the aggregate functions disappeared with the programming interface. For example, in order to get the minimum or maximum value of a row of data in a report, you must create mini programs using the remaining functions and assign them to variables that will be calculated when the report is run. However, *Personal R:BASE* retains the ability to directly read and write *dBASE*, *dBASE III Plus*, and *dBASE IV* files, the

relational operators (such as Join, Project, and Union), and over 70 math functions.

Personal R:BASE uses the same data files as *R:BASE*: one file for the definition of the database structure, a second for the data itself, and a third for the indexes. The data is stored in tables that consist of columns and rows instead of the *dBASE*-style fields and records. Through the use of QBE, it's easy to create a view (a temporary table created on the fly by relating data from two or more tables based on common columns). A view is treated like any other table and can be used as the basis for a form or report. This capability made it very easy to create the test reports for PC Magazine Labs' tests.

READY-MADE APPLICATIONS

Applications created in either *R:BASE* or *Personal R:BASE* are compatible with each other; in fact, *Personal R:BASE* includes the superb *R:BASE* applications generator, Application Express, with the only limitation being the inability to customize the code it creates. Microrim planned this so that *Personal R:BASE* can be used as a portable front-end package for applications created under the complete version, rather than as an applications development environment in its own right. Despite these limits, however, it's possible to create sophisticated menu-driven applications in *Personal R:BASE* using only the Applications Generator and the Forms and Reports generator.

The package includes a number of ready-made applications for home or business users, such as a mailing-list manager, an appointment calendar, and a home finance manager. Although it has a built-in mailing-label generator, it lacks any type of word processor and is incapable of creating mail-merge letters.

SAME SPEED, SAME PROBLEMS

During our testing, *Personal R:BASE* demonstrated the same strengths and weaknesses as *R:BASE*. File imports were very quick, but it was one of the slowest packages when the time came to create the indexes. Its speed on searches put it in the middle of the pack.

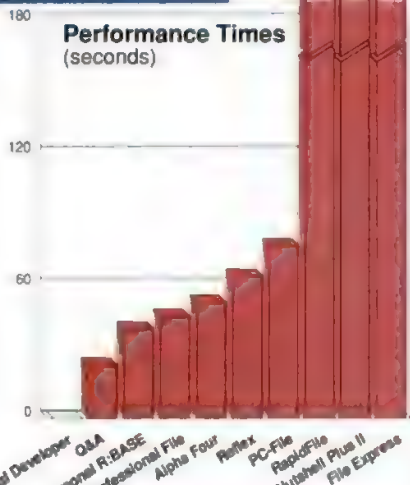
The program was also unable to complete the global modify portion of the tests, since data values could only be replaced with a constant. The ability to replace data with a calculated value is a programming function that can be created under *R:BASE* and run under *Personal R:BASE*. However, that somewhat defeats the idea of using this package as a nonprogrammable database.

PERFORMANCE TESTS: NONPROGRAMMABLE DATABASES

SORT

10,000-Record Tables

Performance Times
(seconds)



The Sort test measures the time it takes for the package to sort a table on an unindexed field in descending order.

10,000-Record Tables

Elapsed Time (minutes:seconds)

Clarion Personal Developer	N/A
Q&A	00:24
Personal R:BASE	00:40
Professional File	00:46
Alpha Four	00:52
Reflex	01:04
PC-File	01:18
RapidFile	03:24
Nutshell Plus II	05:31
File Express	15:09

N/A—Not applicable: The product cannot sort on unindexed fields. ENDS

Suitability to Task

Personal R:BASE

Data loading and access	3
Queries	3
Reports	3
Applications development	2

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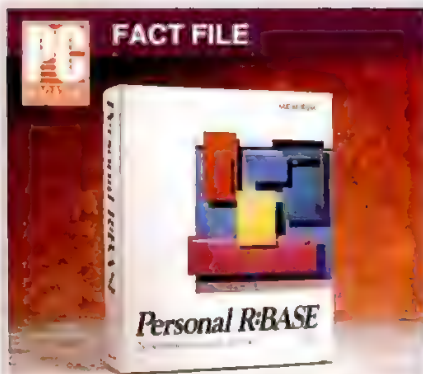
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DATABASES NONPROGRAMMABLE



Personal R:BASE, Version 1.0

Microrim, 15395 30th Pl. SE, Bellevue, WA 98007; 800-248-2001, 206-649-9500.
List Price: \$199.

Requires: 512K RAM, 4.5MB hard disk space, DOS 3.1 or later.

In Short: *Personal R:BASE* lacks some features that are usually considered the reasons for using a nonprogrammable database. It's better suited as a portable version of the full *R:BASE* package than as a nonprogrammable database in its own right.

CIRCLE 401 ON READER SERVICE CARD

Support for the program is free for the first 30 days after purchase. Unfortunately, Microrim has joined the trend toward the use of 900 numbers (\$2 per minute, or a flat \$20 per call) for continued support. If you anticipate needing a significant amount of technical support, purchasing the \$99 Software Maintenance Plan would be a wise decision. If your company is one of the many that has blocked access to 900 numbers, the Software Maintenance Plan is your only choice for continued support.

Personal R:BASE is best suited for companies that use the full *R:BASE* package and want to provide their users with a portable means for accessing data and applications. With *Personal R:BASE*, Version 1.0, casual users can benefit from a relational database without learning how to program one. But the program's limited reporting functions and inability to perform mail-merges make it unsuitable for many database applications that casual users need.

Professional File

by Stephen Walton

For \$299, *Professional File* from Software Publishing Corp. is a well-balanced package for light database duty. Strictly forms-based, *Professional File* has a consistent way of working and is easy to

navigate. Its character-based interface displays convenient pop-up menus that access the forms. Pull-down menus activated by function keys come into play when you work on forms.

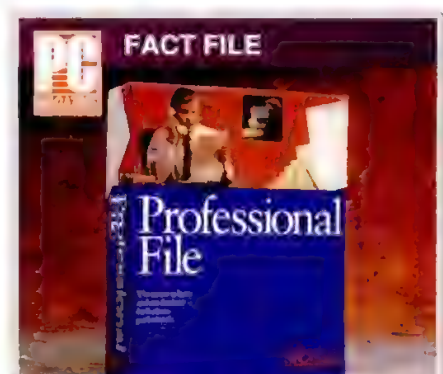
In the *Professional File* environment, you specify queries and reports on the same form you designed for your database. This common form is the groundwork for field formats, defaults, calculation formulas, validation requirements, and indexing, as well as data entry, selection, and reports. Forms may have as many as 32 pages of 100 fields each, plus attachments for memos. Tabular views are also available.

Minor improvements since our last evaluation of *Professional File* ("Flat-File Databases: Fast Answers to Easy Questions," June 26, 1990) include *dBASE IV* file import, detection of duplicate records in all or selected fields, and echoless password entry.

SLOW BACKUPS

Professional File performed adequately on our tests. You would be well advised to avoid its built-in backup function, however, which took 48 minutes to make a packed copy of our 10,000-record test file; use DOS's COPY command instead. Importing a file of this size took less than 4.5 minutes; index-building took under 1 minute, and index deletions took less than 7 seconds. Scan and select operations were brisk, at under 30 seconds, but removal of a field from the database took 39 minutes in one instance and a lengthy 52 minutes in another test.

Testing also brought us up against the limit of *Professional File*'s numeric data type. The limit is 14 digits total, not 14 to the left of the decimal point, as docu-



Professional File, Version 2.02

Software Publishing Corp., 3165 Kiefer Rd., Santa Clara, CA 95051; 800-345-2888, 408-986-8000.

List Price: \$299; network server version, \$500; additional workstation versions, \$225.

Requires: 512K RAM, 720K hard disk space, DOS 2.0 or later.

In Short: Though lacking some of the features you look for in a nonprogrammable database, *Professional File* is a well-rounded system for using data from other sources and for developing and running simple applications.

CIRCLE 402 ON READER SERVICE CARD

mented. If you work with large magnitudes, you won't want to be calculating them here.

Professional File offers some special benefits as a front-end alternative to other database systems. It accepts user-specified field-delimited and quote characters in delimited ASCII files, lets you choose a named range (or the entire worksheet) from a *Lotus 1-2-3* file, and lets you perform "query on import" by selecting records while reading from any of the supported file types.

Although it lacks true joins and dynamic views, *Professional File* provides multifile lookups from *dBASE* files as well as from its own data files for calculations and validations. Some competitors, such as *RapidFile*, lack this ability entirely.

Validations are a strong point for *Professional File*, since they are enforced on data entry and are easy to design on the form. Default field values are readily provided, calculations based on newly entered fields take place immediately, unique indexes are enforceable, and columnar reports are quick and easy to design, with all the basic aggregate functions available.

Crosstab reports such as expense reports that total by date in one direction and by category in the other are a snap to produce in counts, percentages, and to-

Suitability to Task				
Professional File				
Data loading and access	■	■	■	3
Queries	■	■	■	3
Reports	■	■	■	3
Applications development	■	■	■	3

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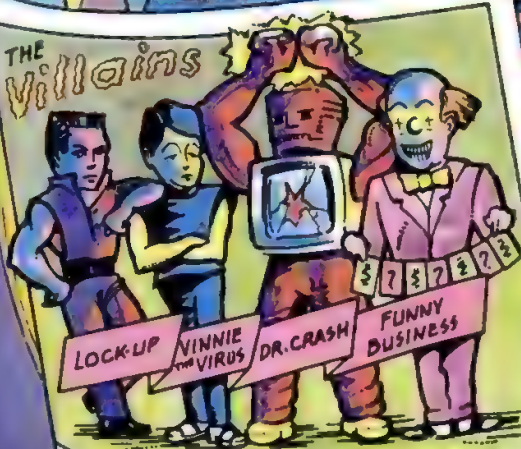
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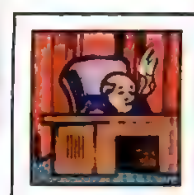
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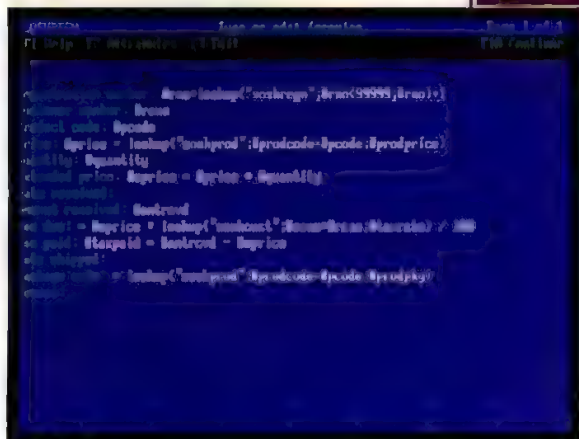
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DATABASES NONPROGRAMMABLE



Formulas entered on this *Professional File* form include lookups into other files and the file in use in order to get sequential registration numbers.

tals. Labels and single-record reports are also easily produced. For the latter you can specify exact printing coordinates for fields and neatly fill in preprinted forms such as blank checks.

Professional File's other major feature is AutoPilot, an applications generator that creates .EXE files and can be launched from DOS (though *Professional File*'s own program files must be in the path). It also provides password protection, custom menus, screen hiding, and the restriction of user activities.

Professional File gives you a window into varied data resources and lets you prepare useful applications that can be run successfully by less confident PC users.

Q&A

by Joe Salemi

In our last roundup of flat-file databases ("Flat-File Databases: Fast Answers to Easy Questions," June 26, 1990) *Q&A*, Version 3.0, from Symantec Corp., just barely missed receiving an Editors' Choice. The improvements in *Q&A*, Version 4.0, are significant enough to make this \$399 package a strong contender for the top spot among all the nonprogrammable databases available today.

Combining semirelational functions and new ways to view data with already strong word processing, reporting, and searching functions, *Q&A* fills the needs of users who don't require the full power of a relational database manager. Best of all, these improvements take nothing away from its easy-to-use interface.

The menu- and function-key-driven

interface has pop-up menus that walk you through the modules. The active function keys and their actions are listed on-screen in the various forms and tables. *Q&A*, Version 4.0, has a new ability to edit data in a table view. Databases are created in the traditional form view, and the excellent context-sensitive help is available throughout the process to assist you in defining the fields. You can assign templates and formats, such as all uppercase, to the fields, and restrictions such as read-only or required.

New crosstab reports in the Report module summarize data by totals, averages, variances, counts, minimums, maximums, and standard deviation. Full font support has been added to both the Write and Report modules; you can now have up to nine fonts in a document or report. A new graphics-based preview mode allows you to fine-tune the appearance of output prior to printing. A thesaurus has been added to the on-line dictionary in *Q&A*, and it can be used anywhere you enter text, even when you're designing the forms and reports. The mail-merge function uses

Suitability to Task				
Q&A				
Data loading and access				3
Queries				4
Reports				3
Applications development				4

the full power of the Write module, and the mailing-label function supports a number of predefined Avery label sheets.

The Intelligent Assistant (IA), a natural-language interface that lets you enter queries in plain English, has been enhanced with a Query Guide. The first step is to have the IA *learn* about the database. This can be a slow process, but once it's completed you can create a query by choosing the data operators, field names, and unique values for the fields from pop-up menus.

NONPROGRAMMABLE?

While *Q&A* does not have a programming language, it does contain a set of programming functions that can be included in forms and reports to help you create fairly complex applications. You can design custom menus and then lock the database to prevent modifications to the design by other users. Data can be protected to the field level, including read-only, read/write, and hidden access. And you can create up to eight user groups to control access to the various parts of the database.

The new Posting feature is chief among the new semirelational functions and lets you add or replace data in an external *Q&A* database file from the current database. Success or failure of the post is

FACT FILE

EDITORS' CHOICE

Q&A, Version 4.0
Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 800-441-7234, 408-253-9600.
List Price: \$399; Network Pack (additional 3 users), \$499; upgrade from Version 3.0, \$85.
Requires: 512K RAM, 3MB hard disk space, EMS for the SQL drivers, DOS 2.0 or later; DOS 3.1 or later for network use.
In Short: *Q&A*'s ability to do searches from external files, particularly *dBASE* files, combined with improvements in the report and write modules, makes it an excellent choice for those who don't need the power of a relational database manager.

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PC Magazine, Oct. 29, 1991

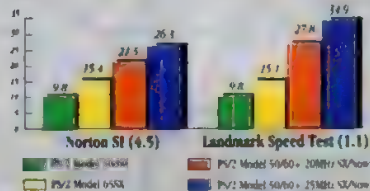
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DATABASES
NONPROGRAMMABLE

indicated in a transaction log. The ability to perform data lookups from up to 16 external *Q&A* databases, external *dBASE III/IV* data files, or an Oracle or Gupta SQL Database server (using drivers available directly from Symantec Corp.) is also new. This feature is powerful but can be confusing; it's not well defined in the manuals, and it took three calls to Symantec's technical support to find someone who was able to talk us through the process of creating a lookup.

Full network support, including record and file locking, is included in the basic package. A Network Pack that supports an additional three users is available for \$499.

LITTLE PERFORMANCE GAINS

Q&A's performance doesn't show much improvement over the previous version. Its results on the Load and Index test put it in the bottom third for those functions. However, it performed admirably on the Search tests, quickly finding and displaying the requested data.

While *Q&A* is able to do lookups, combining data from multiple files slows it down, as indicated by the results of our Report test. According to a Symantec representative, performance can be improved by custom programming with various lookup functions. However, the programming required for this may be well beyond the capabilities of the casual user.

The addition of semirelational functions such as crosstab reports and the links to external databases make *Q&A*, Version 4.0, an excellent choice for casual users who don't need the full power of a relational database manager. The enhancements to the Word Processing and Report modules make *Q&A* the best choice if you

need a database primarily for maintaining mailing-label and customer lists.

RapidFile

by Stephen Walton

Ashton-Tate Corp.'s \$295 *RapidFile*, Version 1.2, shines as a no-nonsense front-end package for quick ad hoc analysis, reporting, and basic manipulation of data from varied sources. It is lean enough to run on systems without hard disks and is characterized by Ashton-Tate as an information organizer.

RapidFile combines database management capabilities with a word processor that does mail-merge, contains a spell-checker, and supports a thesaurus. The net result is a desk accessory that serves as a front end to other databases, readily reorganizes data, provides nearly instant reports, and handles label-printing and form-letter chores.

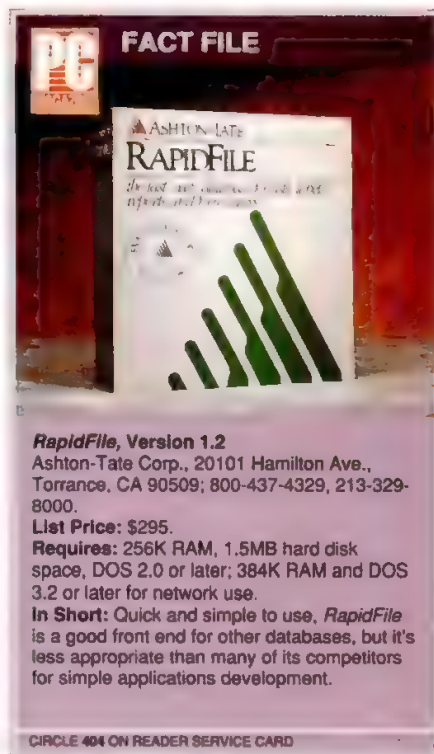
SIX VIEWS

The character-based user interface has pull-down menus and serves up the data in six layouts: table, form, split table and form, label, quick report (columnar format and limited aggregate functions), and custom report (painted design and a greater possible range of derived data). A *snapshot* is a layout that allows selection and sort-order criteria, providing a dynamic view of the data. You can store as many as 250 different layouts or snapshots with each data file.

One of the advantages of *RapidFile's* interface is a query-entry system that makes the logic of a request visible. In addition to supporting all of

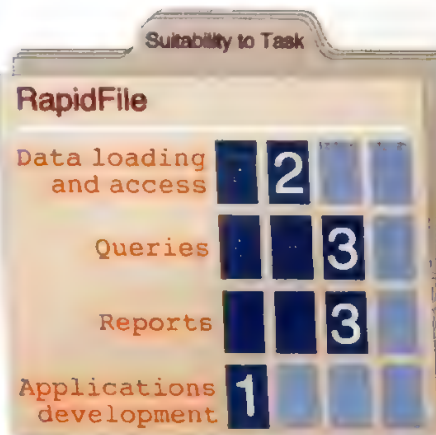


Once Q&A's Intelligent Assistant assimilates information about your database, you can use its point-and-shoot mode to simplify the process of building complex queries.



the customary comparison and Boolean operators, substring, and wildcard comparisons, the Match Criteria screen allows you to specify up to seven alternative sets of criteria to be read. This way, you can make a query that is the union of several selections, each complex in itself.

Rapidfile works with just one data file at a time, but it works quickly. On our Data Import test, it took just over 1 minute to bring in 10,000 comma-delimited ASCII records. To add the data to a pre-existing schema, however, a subsequent append operation was necessary. This took another minute and three-quarters to complete. The entire 10,000-record file was scanned for an unmet selection criterion in just 8 seconds. An update affecting



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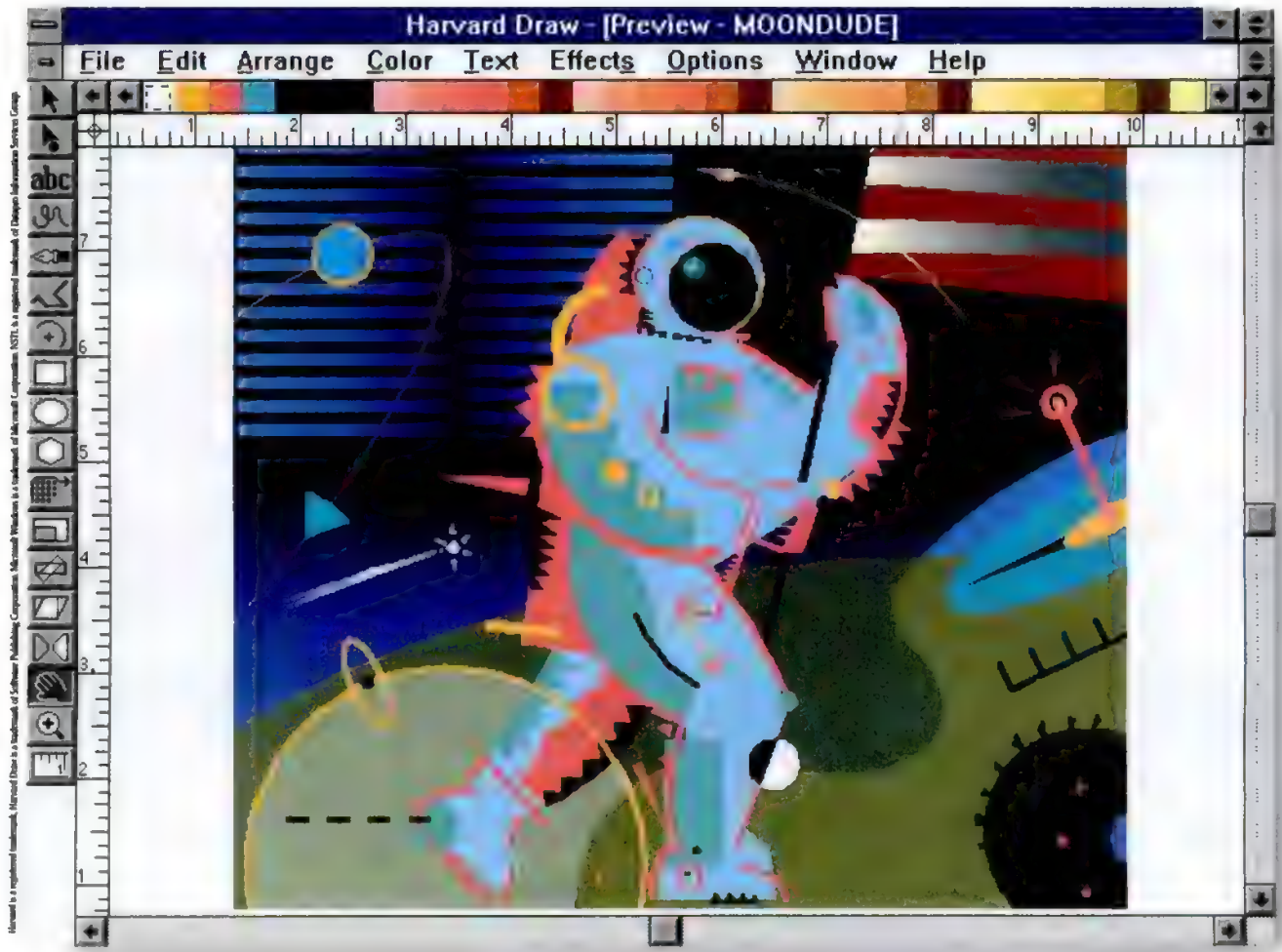
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2 hours and 28 minutes on Harvard Draw.

We urge you to draw

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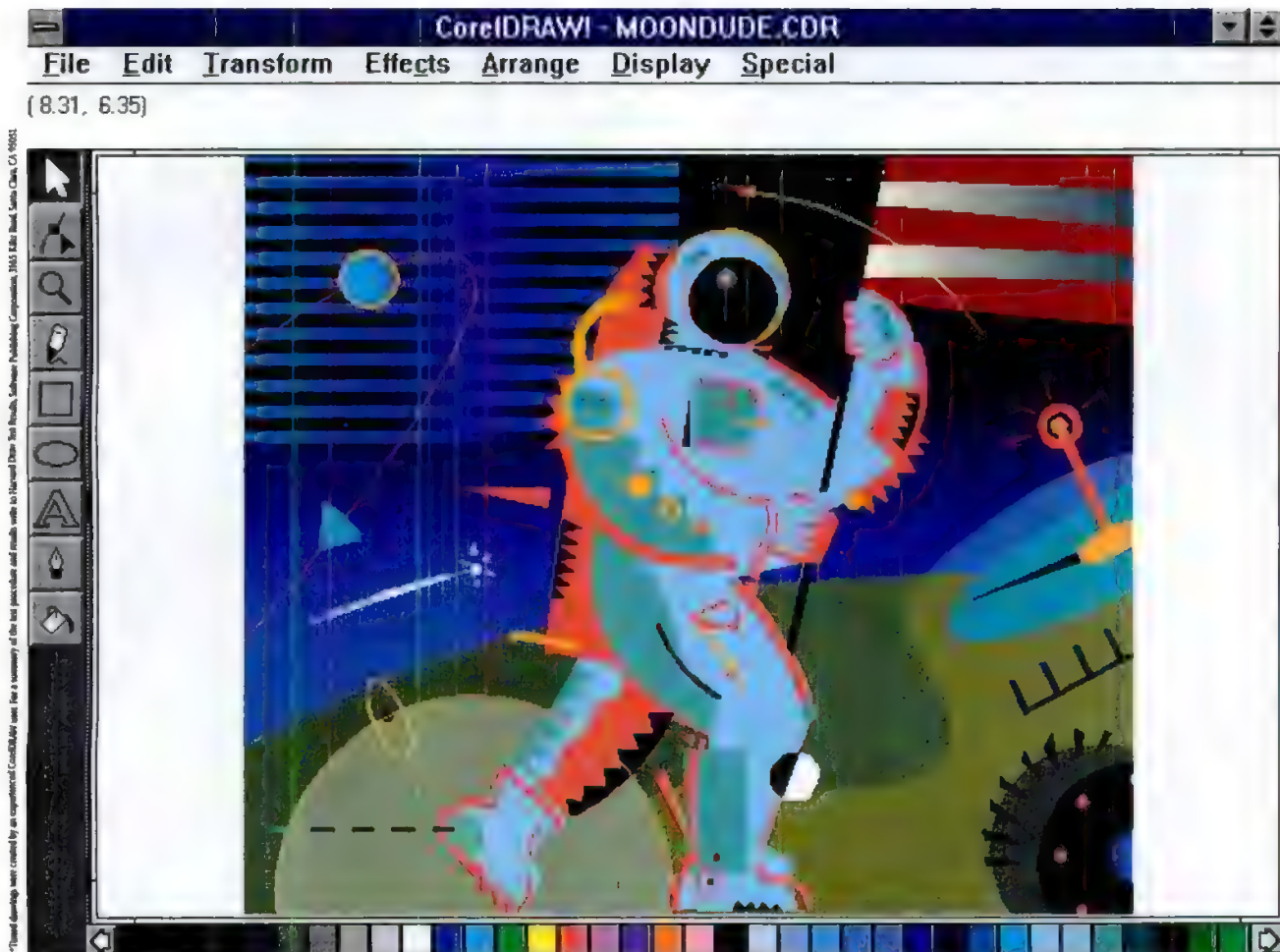
\$99 Trade-Up Offer.

For a limited time, owners of qualifying drawing packages can trade up to Harvard Draw (MSRP \$595) for only \$99. Call today.

For instance, you can do your entire drawing in preview mode, complete with color fills and line widths. Which lets you see what you're drawing as you draw it.

Without jumping back and forth to wire frame. Our WYSIWYG text entry lets you save steps by typing text right into your drawing. Instead

We also urge you to call 1-800-336-8360, Operator 651, for a free Harvard Draw for Win



3 hours and 13 minutes on CorelDRAW.

your own conclusion.

of a dialog box. There's a multiple undo option so you can erase up to 16 actions in a row. And our integrated autotrace is right in the toolbox. So you don't have to leave the program to use it.

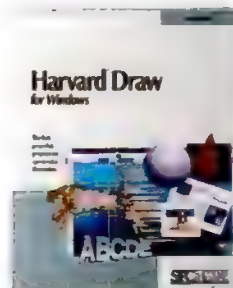


Moreover, in recent NSTL* benchmark tests, Harvard Draw proved several times faster than

CorelDRAW in screen re-draws and file saves. And faster in other ways as well.

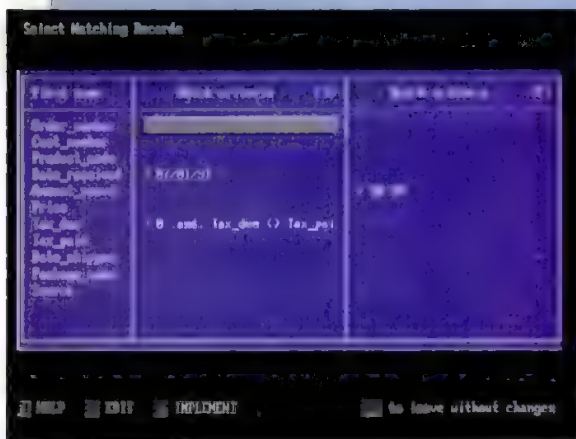
The obvious conclusion? Harvard Draw for Windows is a winner. And you ought to try it.

SPC SOFTWARE
PUBLISHING



dows demo disk and a NSTL benchmark summary.

DATABASES NONPROGRAMMABLE



In this *RapidFile* query, two types of records are requested: those that are dated after July 1, 1991, for which tax was due and not equal to the tax paid, and records of orders for \$100 or more, regardless of date or tax amount.

1,000 of those records was accomplished in 30 seconds.

OUTSIDE DATA SOURCES

Imports from *dBASE*, *Professional File*, and *Lotus 1-2-3* are supported, though not from fixed-length ASCII files. Pulling in that outside data is important, since you are not likely to use *RapidFile* for extensive data entry. You can build field validations into your data file with a BASIC-style language using self-referential calculation specifications. However, these can be ignored by a careless or willful operator, and records containing bad fields can easily be stored.

RapidFile doesn't waste your time with frills. It simply imports data and generates form letters and mailing labels. The ideal *RapidFile* user is a savvy PC user whose primary needs are not database-related, but who occasionally needs to perform some low-level database work with no hassles.

Reflex

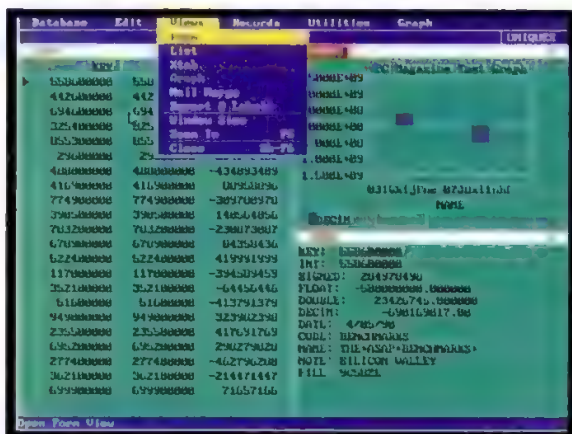
by Joe Salemi

Reflex, Version 2.0, the \$249.95 database package from Borland International, has the most unique interface of all the products reviewed here. While it lacks the ability to combine data from multiple files, its integration of various views of the data combined with a spreadsheet-like ability to execute a "what-if" analysis makes it a powerful tool for analyzing your data in ways you might not have thought possible. This is a database designed for creative thinkers.

MULTIPLE VIEWS

Reflex's interface is graphics-based, with pull-down menus that change depending on what you're doing. Creating a new database is simple: The first screen is a blank form where you define fields by entering their names, and then, by examining the initial input values, *Reflex* makes a best guess of the data type for each field. You can easily change the format or type of data in the field at any time.

Up to this point, *Reflex* is no different from any other forms-based database. It begins to shine when a couple of records are present and when you want to examine and analyze the data. *Reflex*'s graphical interface shows up to four views of the data on-screen at one time, and you can display the data in the initial Form view or in the List (table) view. When both views are on-screen at the same time, the data in one view changes to reflect the changes in the other. Add to this a powerful crosstab view and you have the ability to analyze the data for deviations or trends.



Suitability to Task

Reflex

Data loading and access	2
Queries	3
Reports	3
Applications development	N/A

Reflex can also graph the data in real time, and the graph can be on-screen with any or all of the other three views. One notable feature is the ability to select a data point on the graph and instantly see the data that corresponds to that point in one of the other views. You can then play what-if by creating a database either from new data or from data extracted from an existing database. By using the different views (particularly the Graph view), you can test and analyze various scenarios for their effect on profit margins, cost containment, or production efficiency. Combine the excellent tutorial with the easy-to-use interface and you'll be up and running in a very short time.

SPEEDY PERFORMER

Reflex was one of the better performers on PC Magazine Labs' tests. On both the 1,000- and the 10,000-record tests, it placed in the top half of all the packages for data imports, sorts, and lookups. Although not part of our formal tests, creating a graph of complex data can be slow. And despite its otherwise excellent memory management, *Reflex* was unable to create a complex graph of

Pull-down menus make it easy to use, but *Reflex*'s real strength lies in its ability to display multiple views of data at the same time.

Microsoft® Excel 3.0

You can see the difference between 1-2-3 for Windows and Microsoft Excel in a matter of seconds.

BENCHMARKS		INFO WORLD
September 9, 1991		
Windows Spreadsheets		
	Microsoft Excel Version 3.0	Lotus® 1-2-3® for Windows™ Version 1.0
CALCULATION (all times in seconds)		
Arithmetic model		
Recalc partial	<1	2.5
Recalc all	1.6	4.3
File load	6.9	10.5 - 12.2
File size (in bytes)	243,644	219,258
Financial model		
Recalc all	11.4	34.9
Scientific model		
Recalc all	3.7	10.0
CONSOLIDATION		
Page-oriented model	5.0	<1
File-oriented model	<1	1.3
Tests performed on a COMPAQ DESKPRO 386/20e™ with 4 megabytes of RAM and 110-megabyte hard drive. Times given as ranges reflect when cursor control was returned and when the recalculation was completed.		

Microsoft Excel is over two times faster than 1-2-3 for Windows by virtually every measure.

Microsoft

the 10,000-record database. Complaining of insufficient memory, it exited the graph function after almost 20 minutes of calculation.

Also, we encountered a problem with import routines when attempting to import the comma-delimited file. (*Reflex* was unable to import the fixed-record data.) It would quickly import the whole file without producing any error messages, but it would not import the floating-point data, even when the import field was defined as such. Those fields would show "ERROR" as the value when the import was finished. The only way that *Reflex* was able to complete the performance test was by importing the test data from a .DBF file and proceeding from there.

Performing data searches was simple with *Reflex's* Filter function. You can search on any or all of the fields and limit searches to a data range. The reporting functions are also easy to use, and *Reflex* covers mail-merge well. Mailing labels and mail-merge letters can be created, and mail-merge templates can be edited inside the program or imported from one of the seven supported word processing formats.

DATABASES NONPROGRAMMABLE



Reflex, Version 2.0

Borland International Inc., 1800 Green Hills Rd., Scotts Valley, CA 95006; 800-331-0877, 408-438-5300.

List Price: \$249.95.

Requires: 512K RAM, 3.5MB hard disk space, DOS 2.0 or later.

In Short: Though it lacks the ability to combine data from multiple files, *Reflex's* ability to display multiple views of the data makes it an excellent tool for a "what-if" style of analysis.

CIRCLE 405 ON READER SERVICE CARD

NO MERGING ALLOWED

One ability noticeably lacking in *Reflex* is lookups. All of your data must be contained in one database, and there is no method of merging data from other files. The package also uses a proprietary file format and is unable to manipulate .DBF files directly.

Though *Reflex* can record and play back keystrokes, it cannot create applications. Data security is nonexistent, and there is no way to prevent a user from examining the entire data file. While deficient in these areas, *Reflex* is still a good choice if you don't need to combine data from multiple files. Its real strength is in the unique ways it lets you handle your data analysis tasks.

If you need to look at data in different ways, then consider adding *Reflex*, Version 2.0, to your toolkit, regardless of what package you use as a primary database. ■

Greg Pastrick is a Massachusetts-based free-lance writer and frequent contributor to PC Magazine. Joe Salemi is a contributing editor of PC Magazine. Stephen Walton is a New York-based computer consultant and free-lance writer.

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"Using M.Y.O.B. is simple and direct." — Macworld May, 1990

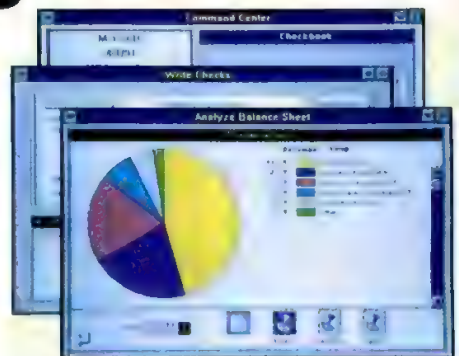
Change anything entered in the current session, automatically reverse entries made in prior sessions.

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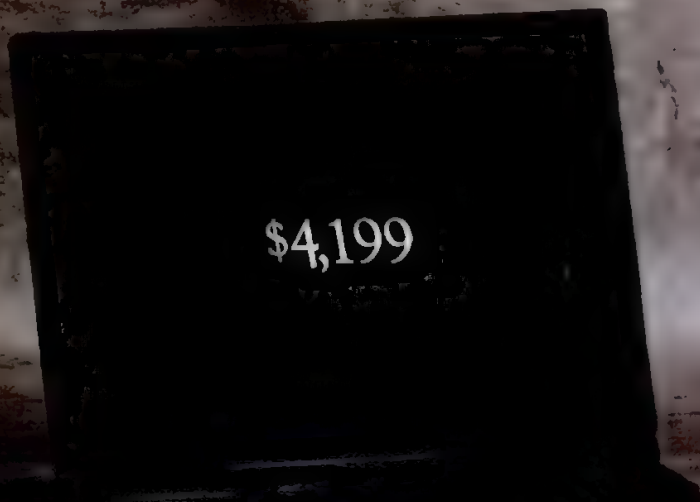
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CIRCLE 378 ON READER SERVICE CARD



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**WAS A
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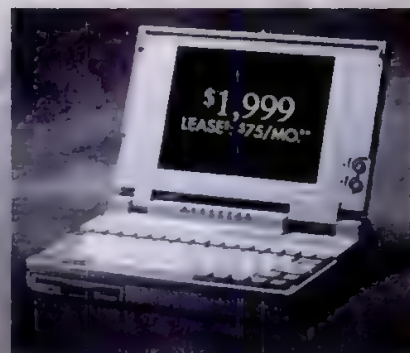
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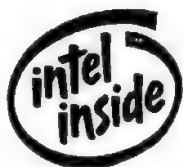
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A. Fold bill in half lengthwise.



B. Fold back front corners.



C. Make second fold on front corners.



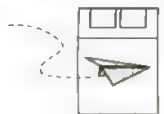
D. Make a second lengthwise fold down.



E. Hold airplane up between thumb and forefinger.



F. Open a window. Toss.



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CIRCLE 519 ON READER SERVICE CARD

Are Home PCs Good Enough For Your Friends?



ILLUSTRATION: MARGARET CUSACK
PHOTO: WALT CHRYNYSKI

A home PC, according to most PC Magazine readers, is a product usually bought from a no-frills vendor, having the most power at the lowest cost possible. To a growing number of your friends, relatives, and neighbors, a home PC is becoming a necessity. But help in getting started—not power—is what they are looking for.

by Jonathan Matzkin

Anyone who has ever helped a PC-illiterate friend acquire and learn to use a PC knows what it means to be a part-time social worker. The phone rings at all hours of the day or night, and an anguished voice inevitably demands something like, "Where did all my work go, and what's all this stuff about files and directories?!"

In the sink-or-swim world of business computing, workers either learn to deal

with their PCs or fade away. Enlightened companies provide training if they can afford it. High schools and colleges are increasing their demand for computer literacy, along with more-traditional skills, and are making it a graduation requirement. But one way or the other, the PC has largely taken over American business.

Not so the American home, but this is changing.

More and more people are buying PCs for the living room or den, even though they have little or no contact with the office PC. Needless to say, these brave souls have special needs. A growing number of manufacturers are configuring systems that they tout as easy to learn and use, even for the home user.

Clearly, these are not systems that most *PC Magazine* readers would buy for themselves. A knowledgeable and savvy group, our readers want pretty much the same

things in a home machine that they seek at the office: power, storage, advanced graphics, and the other prerequisites for running powerful software. They aren't concerned, for the most part, with being sheltered from the complexities of DOS or the difficulty of learning *Microsoft Windows*. They already know all about these things, which is exactly why the *PC Magazine* reader is so often asked to suggest a system for a less knowledgeable friend or relative.

Making such a recommendation is a gesture that can come back to haunt unsuspecting power users. They may find themselves functioning as ad hoc support staff for the struggling recipients of their advice. From the perspective of the knowledgeable user, it is important to recommend a system that will itself do as much

of the teaching and nurturing as possible.

That consideration was foremost in our minds as we evaluated home PC packages from six manufacturers: IBM, Leading Technology, Philips Consumer Electronics Corp., Samsung Information Systems America, Sun Moon Star, and Tandy Corp.

In addition to rating these machines for ease of installation and setup—two things that are certainly perilous for the PC beginner—we decided to consider only those systems that shelter users from the vagaries of DOS. The venerable PC operating system is another major source of trouble for neophytes, and we scrutinized these machines carefully to see what sort of buffer they put between the user and the command line. Since choosing and installing software is another quagmire for the beginner, we also scrutinized the utilities and applications that come with each system; only systems with software preloaded on standard-equipment hard disks met our selection criteria.

Ideally, any PC intended for novices combines strong on-line help with plenty of tutorial material, both on general PC concepts and on the specific software provided. All of the systems we included did so, with varying degrees of success.

There should also be some simple software to help the unsteady novice gain confidence. For example, the programs in the Appliances section of *GeoWorks Ensemble* are readily accessible, extremely simple to use, and rapidly outgrown. With newfound confidence, the user can progress to the more substantial programs available in this graphical environment, which is used to unify and organize the software presented with the Magnavox HeadStart SX-20 CD, reviewed in this roundup.

Five of the six reviewed machines come with graphical user interfaces, and perhaps that accounts for the preponderance of 80386SX-based machines in our test group. The extra muscle and higher clock speeds of these machines—the SX-20 CD is a 20-MHz system—provide the oomph necessary to crank extra performance out of graphics-mode environments. The lone 286 in the group, the Tandy 1000 RLX, seemed distinctly out of place among its faster competitors.

The reserve power of the 80386SX processors lets systems grow along with their users as beginners become avid hobbyists and perhaps even power users. Individuals are not likely to upgrade their

EDITORS' CHOICE

■ Magnavox HeadStart SX-20 CD

We reached several conclusions as we evaluated these six home PCs. The most important one is the simplest: None of these machines is the ideal home PC. The Magnavox HeadStart SX-20 CD comes the closest, however. Its setup documentation could use some touching up, but the vast majority of inexperienced users will be able to use this PC without much of a problem. After putting the system together and powering it up, PC neophytes will find in *GeoWorks Ensemble* a true graphical user interface that is simple enough for a novice to use and powerful enough to satisfy a more advanced user.

GeoWorks Ensemble's Appliance applications are easily accessed and build confidence in new PC users before leading them into more-challenging and more-useful software.

The SX-20 CD's software bundle, combined with its very capable hardware, makes it an almost irresistible value. The CD-based applications, in particular, deliver the kind of "gee-whiz"

functionality that nontechnical consumers expect from computers to start with. The SX-20 CD's vast storage capability, combined with high-resolution VGA graphics and sound, bring this PC vividly to life.

The one irritating flaw we found in this package is the absence of a modem, which is all the more annoying because *GeoWorks Ensemble* comes with software for accessing America Online.

One other machine deserves an honorable mention. The IBM PS/1 Model 2121B82 is a powerful and reasonably expandable system that takes up a bare minimum of desk space. The care with which IBM designed this machine for easy operation—especially the software shell—makes this a wonderful machine for the user who doesn't want to become bogged down in technical details in order to use a PC. The new model is more powerful than last year's, and with the addition of an expansion slot, IBM has responded to complaints that last year's PS/1 was underpowered.

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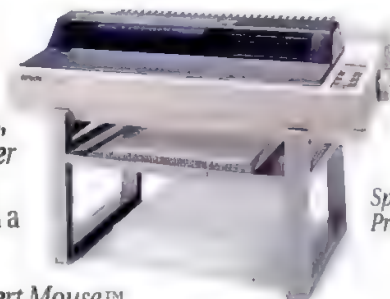


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CIRCLE 199 ON READER SERVICE CARD

The question we kept asking was, "Would a new user be able to figure this out?"

COMPUTERS HOME PCs

soft Bookshelf to games of every description.

In several ways, this PC roundup differs from the comparisons you usually find in *PC Magazine*. We're comparing PCs across processor lines, deemphasizing performance, and paying careful attention to the software installed on the system (and the way it was installed).

As we evaluated the machines, the question we kept asking was, "Would a new user be able to figure this out?" In most cases, the answer was yes; these machines were carefully designed to point a novice in the right direction. That doesn't mean the new user won't eventually stumble into DOS, delete a file, and receive endless "Abort, Retry, Fail?" messages. With this in mind, we have also considered the extent of technical support

iron nearly as often as businesses typically do, so a little growing room assures that a machine bought today won't balk at running desktop publishing or elaborate game software tomorrow. Of course, the rapidly disappearing price differential between 80286 and 80386SX chips, coupled with falling RAM prices, contributes to the viability of the SX as a processor for home machines.

If it is clear that the 386SX is the appropriate entry-level engine for the living room as well as the office cubicle, it is less certain which associated hardware belongs in a basic home PC configuration. This is how we feel after looking at the machines these home computer vendors sent to us. While all but one of the six machines offers at least 2MB of RAM, and the smallest of the hard disks holds 40MB, manufacturers seem less certain about the need for a modem.

Only two systems came with this relatively inexpensive peripheral—truly surprising, since on-line services such as America Online and Prodigy are aimed squarely at home users. Two machines even offered simple-to-use connection software for on-line services, but no modem. Not only do on-line services open an entirely new vista for the home user, they also offer a convenient opportunity for manufacturers to supply cost-effective support via user forums.

CD-ROM drives present a different kind of problem. Only two of our evaluation systems, the SX-20 CD and the Sun Moon Star 386SC-16/CD-ROM, offer CD-ROM drives. While CD-based applications offer massive storage for graphics applications (such as atlases) and database-oriented software (such as encyclopedias), they are still expensive. It's also not yet clear whether CD-ROM will take hold before some other technology comes along to supplant it. But the two systems that exploit the technology offer by far the largest and most varied software selection, from reference works such as *Micro-*

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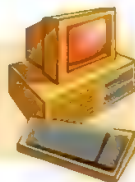
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IBM CORP. IBM PS/1 Model 2121B82



In last year's roundup of home systems, we complained about the IBM PS/1's limited expansion possibilities and its poky 10-MHz 80286 processor. The optional 30MB hard disk seemed small, and motherboard RAM capacity was a mere 1MB. All of these concerns have been addressed, and IBM Corp. has improved the PS/1 in a host of other ways. With newfound muscle (courtesy of a 16-MHz 80386SX processor) and much greater expansion potential, this year's \$2,199 IBM PS/1 Model 2121B82 merits attention from anyone interested in putting a computer in the kids' room or in the family room.

While IBM will continue to sell the original 80286-based systems, there are two new SX-driven PS/1 models. Both come with 2MB of RAM, a 2,400-bps modem, an IBM mouse, and a proprietary IBM SCSI connector. They also arrive with DOS 4.01, the PS/1 DOS shell, *Microsoft Works*, and software for Prodigy and IBM's Promenade on-line services already installed on the hard disk. (For systems without hard disks, the software comes on floppy disks.)

The Model 2121C42, with a discounted

COMPUTERS HOME PCs



The IBM PS/1 Model 2121B82's opening screen is a proprietary shell with just four choices: on-line services, the DOS prompt, *Microsoft Works*, and a graphical view of the disk's directory.

price of about \$1,399, comes with a 40MB hard disk; the Model 2121B82, which we examined for this review, sells for about \$1,799 discounted and features an 80MB hard disk, *Microsoft Windows*, and in a big change for the PS/1 line, two 16-bit expansion slots. These prices represent IBM's estimate of actual selling prices; list prices are \$1,699 for the Model 2121C42 and \$2,199 for the Model 2121B82. IBM will continue the policy of selling the PS/1 primarily through electronics outlets and department stores.

Options include \$279 2MB and \$549 4MB RAM cards, which plug into a proprietary slot; a \$249 combination MIDI sound card and joystick port, which also mates with a proprietary connector; and a \$169 external adapter unit that adds three standard expansion slots to the Model 2121C42. You can add a second drive, with an 80MB (\$1,060) or 129MB (\$1,500) capacity, to the Model 2121B82, but when it is installed, the drive blocks one of the system's two expansion slots.

In a joint venture with Britannica Software, IBM is offering a \$995 CD-ROM module that attaches to the bottom of the system unit of any PS/1 equipped with a hard disk. The CD-ROM drive comes with an assortment of disks, including *Compton's MultiMedia Encyclopedia*, another disk holding 15 educational programs, and a third CD containing 7 home-

office applications programs.

As with last year's model, the monitor contains the system power supply. There are definite drawbacks to this arrangement (using a third-party monitor is out of the question), but there are clear advantages as well. By removing the power supply and its inevitable heat from the system unit, IBM is able to build a small CPU. Cooling vents are placed efficiently at the top of the monitor case, where stacked components do not block ventilation.

Setting up the Model 2121B82, which comes packed in a single convenient box, could hardly be easier. Even the most deliberate, careful beginner should have to spend no more than 10 minutes making the six necessary hardware connections (two for the monitor/power supply, one for the mouse, one for the keyboard, and one to connect the modem to a phone line). A photograph on page 2 of the Getting Started booklet displays and clearly labels all of the necessary connections.

Flipping the power switch brings up IBM's colorful top-level PS/1 menu, which offers new users a choice of four large buttons to click on. The Information button provides access to the included on-line services as well as to detailed tutorials for the overall system and for *Microsoft Works*. Clicking on the button marked "IBM DOS" shells out to DOS 4. The *Microsoft Works* button launches the integrated package, and the top-level menu's fourth button, Your Software, accesses a program launcher that uses a file folder metaphor to organize all of the software on the system, including *Windows*. The only thing missing is a group of simple apps that would allow novices to get going with a minimum of confusion.

A user who has outgrown the simple PS/1 interface can redo the startup files and have the Model 2121B82 boot directly into *Windows*.

The standard documentation is provided for *Microsoft Works* and *Windows*. In addition to the Getting Started pamphlet, IBM supplies a user reference to the system, which introduces basic computer concepts and discusses menu choices for the PS/1 shell and other software in some detail. It also discusses basic concepts, such as file-naming conventions and directory structures.

IBM says that user support will be provided mainly through the PS/1 Club section of the Prodigy on-line service;



FACT FILE

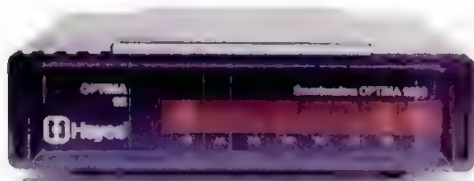
IBM PS/1 Model 2121B82

IBM Corp., Old Orchard Rd., Armonk, NY 10605; 800-426-2468.

List Price: With 2MB RAM, 80MB hard disk, 3.5-inch floppy disk drive, VGA monitor, modem, mouse, \$2,199.

In Short: IBM's new home machine looks like earlier models, but this is where the resemblance ends. This SX-powered machine is expandable, has plenty of disk space, presents an easy shell, and offers elaborate on-line services via its standard modem.

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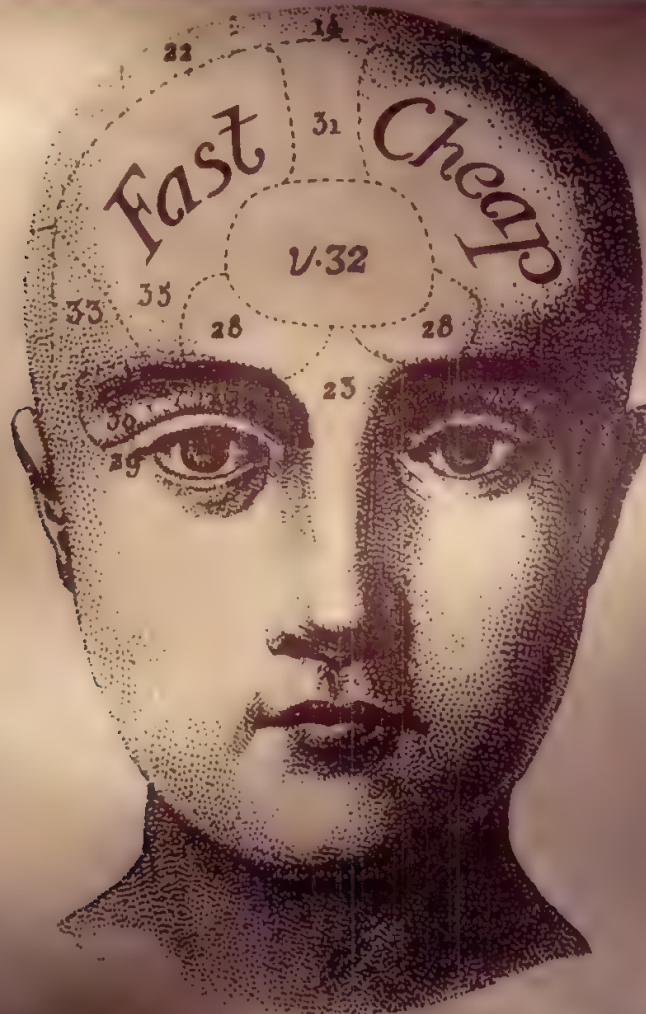


Fig.32.

users can transmit questions and receive answers via modem. Questions about all of the bundled software, including the Microsoft products, will be fielded by the club, which is available 365 days a year, 24 hours a day. Additional on-line help is available from the Promenade service. This joint venture with Quantum Computer Services provides on-line classes and forums that educate the new user on a variety of PC-based topics.

Both PS/1 models are guaranteed for one year. IBM maintains an 800 Express Maintenance number (available Sunday through Friday, 9:00 A.M. to 12:00 midnight) for service. If a call to the number reveals that the user's machine has failed, a replacement system is sent to the user within 48 hours, in exchange for the defective system.

The IBM PS/1 Model 2121B82 is a fine choice for the home environment. It is extremely compact and very easy to set up, and it comes with several quality software applications. The on-line services in particular are the most elaborate of any offered by the machines we examined. With its enhanced power and expandability, it can grow with its user and would make a good machine for small-business use. (IBM's interest in the small-business market is reflected in its stated intention to introduce an SX-based PS/1 with Version 2.0 of OS/2; this system will probably appear sometime next year.)

Even so, the Model 2121B82 loses points for not offering a standard configuration that includes a CD-ROM drive, and for not including some very basic applications for the absolute PC beginner.

LEADING TECHNOLOGY INC. PC Partner XI



Most manufacturers have a specific configuration in mind when they talk about a home computer. Machines like the IBM PS/1, the Magnavox HeadStart series, and the Samsung Sensor SP-386SX are configured to meet some expectation of what a home computer should do. Such definite configurations shield the inexperienced purchaser from making decisions he or she may not be prepared for: Do I need a modem? How large should the PC's hard disk be?

Leading Technology takes a somewhat different approach. It doesn't maintain a

COMPUTERS HOME PCs



FACT FILE

PC Partner XI

Leading Technology Inc., 10430 S.W. 5th St.,
Beaverton, OR 97005; 503-646-3424.

List Price: With 4MB RAM, 40MB hard disk,
3.5-inch and 5.25-inch floppy disk drives,
VGA monitor, AudioWare sound package,
mouse, \$1,499.

In Short: Leading Technology provides a lot
of hardware and software at a reasonable
price. Configurations for this machine are not
standard, however, and may vary. Although
the setup materials could use some work, our
test unit's sound capability was outstanding.

CIRCLE 228 ON READER SERVICE CARD

catalog of set configurations; instead, the company custom-configures machines to the specifications of resellers who buy them in volume. The idea is to compete on price, rather than offer a fixed feature set, on the theory that price is a significant consideration for the majority of consumers.

You should understand that the PC Partner XI we tested is but a single point on the continuum of possible configurations. The company does not suggest list prices, leaving that responsibility to the store, but a company spokesperson said that the configuration we examined would sell for as low as \$1,400 (including a 14-inch VGA monitor) in some outlets.

Setup materials were not as clear or as concise as they should be. The neophyte computer owner works with a total of three documents in the process of hardware setup. Some operations are reduced to breezy language: "Connect any other peripheral devices to the computer (such as a mouse or printer) as needed." This is simply inadequate help for someone who has never before dealt with a PC.

The 16-MHz 80386SX system came with a 40MB hard disk and 3.5-inch and 5.25-inch floppy disk drives. Our tested configuration did not include a modem, and Leading Technology does not at present offer a CD-ROM option. Our configuration had two available full-length 16-bit slots. The system came with 4MB of RAM, the most of any of the machines we tested.

Aside from its generous RAM complement, the PC Partner XI was further distinguished by the most extensive sound capabilities of any of the tested machines, courtesy of a hardware/software combination called AudioWare. This system's

stereo sound card is compatible with Sound Blaster and Ad Lib adapters, making it suitable for a wide variety of games and educational software. The card also has a combination MIDI/joystick port.

The card samples voice or other sound input through an included microphone and plays it back through a set of powered speakers that are also included. Text-to-speech capabilities allow spoken playback of text.

Leading Technology supplies several programs that demonstrate the AudioWare system, which is also employed with *HyperDOS*, the character-based environment that the PC Partner XI boots into. Clicking on various *HyperDOS* buttons produces brief, somewhat informative spoken cues that describe the selected options. Returning to the environment's main screen, for example, produces the comment, "You are now viewing the home screen."

HyperDOS's initial screen presents four large buttons to the user, much the way IBM's PS/1 environment does. The Knowledge button opens a brief on-line manual. The Accessories button brings up a point-and-click menu of rudimentary applications, such as a card file, a calculator, and a clock. The DOS Operations button accesses a DOS file manager that handles such chores as copying, deleting, and renaming files. While extensive help files are provided, at times this part of the *HyperDOS* interface gets as confusing as DOS itself.

The fourth button in the *HyperDOS*



Leading Technology's PC Partner XI boots into a *HyperDOS* text-based shell that resembles the IBM PS/1's shell. Thanks to the machine's sound card, you can hear a spoken description of each option.

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333		
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High-Resolution VGA	\$2995	\$3095

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main screen starts a program launcher. Our evaluation unit had only the audio demonstration programs loaded. Under this circumstance, inexperienced users would be hard-pressed to figure out that *Microsoft Windows* and Spinnaker Software Corp.'s *PFS:WindowWorks* (a very comprehensive integrated package) are also preinstalled on the disk. Installing these in the launcher was a trivial matter for an experienced user; the same task would undoubtedly stop a beginner cold.

Phone technical support from Leading Technology is available Monday through Friday from 6:00 to 5:00 P.S.T., and Saturday from 8:00 to 4:00. The company refers questions about third-party software to the original publisher. GE Service Corp. provides on-site service for one year, and an optional extended warranty is available.

The configuration we tested has a lot going for it, but Leading Technology's resistance to providing standard configurations raises problems for someone giving a recommendation to a new user. The AudioWare package, for instance, is not standard; it may be sold with the machine in some outlets but not in others. The range of variations also makes it difficult for Leading Technology to produce clear, simple setup documents that are specific to each configuration. The PC Partner XI's low price and basic quality are enticing, but only for those buyers who can rely on an experienced friend for advice and support.

**PHILIPS CONSUMER
ELECTRONICS CORP.**

**Magnavox
HeadStart SX-20 CD**



Philips Consumer Electronics' Magnavox HeadStart series combines quality hardware with a generous assortment of carefully chosen and presented software. These aggressively priced systems range from the 80286-driven HeadStart 286 (\$999) to the 80386 DX-powered HeadStart DX-33 (\$2,599). Monitors are not included in the suggested retail prices.

All of the HeadStart systems come with the graphical operating environment *GeoWorks Ensemble*, and all except the HeadStart DX-33 are available with an internal CD-ROM drive and a selection of CD-ROM-based software. We chose to examine the SX-20 CD because it offers

solid 20-MHz 80386SX performance (it was easily the fastest of the machines we tested for this roundup), and this is coupled with a truly impressive variety of software, all for a suggested list price of \$2,099. Adding Magnavox's 14-inch color VGA monitor brings the complete system price to \$2,698. Philips says that these prices are intended to be very close to actual selling prices, and there probably won't be more than a 10 percent discount offered by individual retailers, at least for the time being.

Setting up the SX-20 CD is a fairly simple process that should take about 30 minutes if you carefully follow the provided instructions. It arrives in two boxes: one for the system unit and one for the monitor. A smaller box inside the system unit box holds the keyboard; another contains the software, documentation, and accessories.

A Read Me First pamphlet describes the setup process with reasonably clear diagrams, but some of them seem to refer to more than one possible configuration. One diagram, for instance, depicts both a motherboard-mounted graphics adapter and an adapter mounted on a card. That could easily and unnecessarily confuse a PC beginner. The first piece of documentation that a user comes across should be as clear and specific to the supplied hardware as possible. The diagrams have no explanatory captions, which probably allows Philips to use the same pamphlet in foreign-language markets. That's fine for Philips, but it short-changes the user.

In addition to the internal CD-ROM



When you turn on the Magnavox HeadStart SX-20 CD, the opening screen for *GeoWorks Ensemble* organizes programs under three headings: Appliances, DOS Programs, and Professional.

drive, the SX-20 CD comes with an 80MB hard disk and a single 3.5-inch floppy disk drive. The motherboard-mounted video controller supports standard VGA modes, as well as Super VGA (800 by 600 pixels) with 16 simultaneous colors. The system comes with 2MB of RAM, expandable to 8MB on the motherboard. The parallel port and two serial ports are integrated into the motherboard.

You can route audio output from the CD-ROM drive through a stereo system via two RCA connectors mounted on the back of the CD-ROM controller, which resides in an expansion slot. There are a total of four slots, three of which are available. There are also two available drive bays in the SX-20 CD's standard configuration.

The SX-20 CD's hardware roster is rounded out by a three-button mouse and a pair of fine-sounding Walkman-style headphones. You can plug the phones into the CD-ROM's front-panel-mounted headphone jack and use it to listen to the audio portion of CD-ROM disks or to standard audio CDs. This PC's only glaring hardware deficiency is the lack of a modem.

Even more impressive than the SX-20 CD's hardware endowments is its long list of standard software. In addition to *GeoWorks Ensemble*, offerings include DOS 4.01 and Release 2.2 of *Lotus 1-2-3*. The latter compensates for one of



Magnavox HeadStart SX-20 CD

Philips Consumer Electronics Corp., One Philips Dr., Knoxville, TN 37914; 800-722-6224.

List Price: With 2MB RAM, 80MB hard disk, 3.5-inch floppy disk drive, internal CD-ROM drive, mouse, \$2,099; VGA monitor, \$599; 2MB RAM upgrade, \$200.

In Short: This machine offers a beautifully customized *GeoWorks Ensemble* working environment, and its wealth of bundled software is preloaded on the hard disk and also on CD-ROM. A large hard disk and 20-MHz performance make it more than just a home computer.

CIRCLE 620 ON READER SERVICE CARD

COMPUTERS

HOME PCs



HOME PCs: SUMMARY OF FEATURES

Products listed in alphabetical order

The features table for home PCs highlights a different set of categories than you normally find in *PC Magazine's* PC reviews. You should judge a home PC by the applications **software** installed on its hard disk and by the company's ability to answer **technical** questions.

	IBM PS/1 Model 2121B82	Leading Technology PC Partner XI	Magnevox HeadStart SX-20 CD	Samsung Sensor SP-386SX	Sun Moon Star 386SC-16/ CD-ROM	Tandy 1000 RLX
List price (tested configuration)	\$2,199.00	\$1,499.00	\$2,099.00	\$1,995.00	\$2,995.00	\$1,828.95
HARDWARE						
Processor	80386SX/16	80386SX/16	80386SX/20	80386SX/16	80386SX/16	80286/10
Hard disk capacity	80MB	40MB	80MB	40MB	40MB	40MB
Floppy disk drive	3.5-inch	3.5-inch, 5.25-inch	3.5-inch	3.5-inch	5.25-inch	3.5-inch
Video	VGA	VGA	VGA	VGA	VGA	VGA
2,400-bps modem	■	□	□	■	□	□
Available expansion slots	Two 16-bit 11-inch	Two 16-bit full-length	Three 16-bit full-length	Two 16-bit full-length	One 8-bit, two 16-bit full-length	One 8-bit 9.5-inch
Special options	SCSI adapter, MIDI/joystick adapter	AudioWare sound card	None	External 5.25-inch floppy disk drive	CD-ROM software	Internal three-voice sound source with 8-bit DAC
SOFTWARE						
Software included	Microsoft Windows, Microsoft Works, Prodigy and Promenade startup kits, Windows Productivity Pack	Audio demo, Microsoft Windows, PFS:WindowWorks	Lotus 1-2-3, Version 2.2; The Manhole; Microsoft Bookshelf; The New Grolier Electronic Encyclopedia; Small Business Consultant; Stat Pack	Balance Point; Microsoft Windows; The Norton Backup; The Norton Utilities, Version 5.0; Prodigy startup kit; Your Way	Assorted CD-ROM games; CD Guide, Optical Edition; CheckIt; Hotline II Executive; Microsoft Bookshelf; Microsoft Windows; PC-Globe; PC Tools; PC-USA; Small Business Consultant; Software World Atlas; Software Toolworks Illustrated Encyclopedia; Stat Pack	Basic DeskMate applications, DeskMate, home organizer applications
DOS version	PC DOS 4.01R	DOS 5.0	DOS 4.01	DOS 4.01	DOS 4.01	DOS 3.3
Shell	Proprietary IBM design	Hyperpad	GeoWorks Ensemble	Microsoft Windows 3.0	Microsoft Windows 3.0	DeskMate
SERVICE AND SUPPORT						
Tech support	800 number or Prodigy	800 number	800 number	900 number (1 minute free, then \$1.50/minute)	800 number	Local Radio Shack
Hours and days available	365 days a year, with Prodigy PS/1 users club	6:00–5:00 M–F, 800–4:00 Sat. (P.S.T.)	8:00–6:00 M–F (E.S.T.)	9:00–8:00 M–F (E.S.T.)	7:30–5:00 M–F (P.S.T.)	Hours vary
Length of warranty	1 year	1 year	1 year	6 months	3 years	1 year
Service	Bring to store or arrange exchange via 800 number	On-site	On-site	On-site	On-site	Local Radio Shack

PC —Editors' Choice

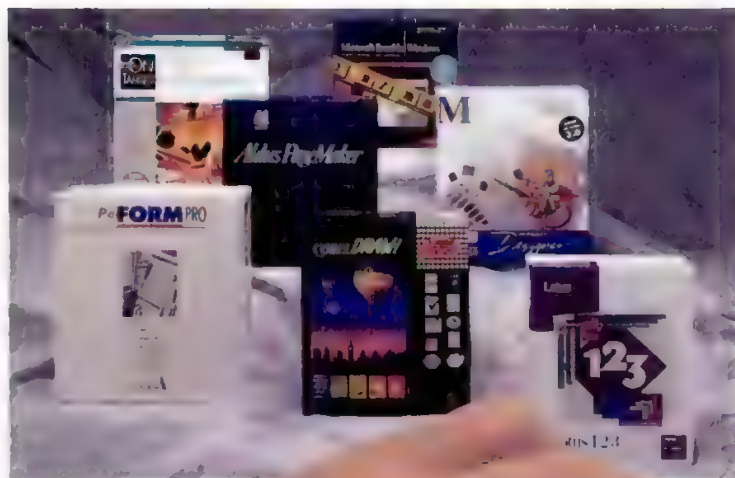
■—Yes

□—No

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CIRCLE 250 ON READER SERVICE CARD

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Backup.
For people who
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Everyone who uses a PC ought to back up regularly. But most people don't back up at all.

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Now you can set up fully automatic, unattended backups for every PC in the house.

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The latest version of the world's most popular backup software comes complete with a backup policy of its own — in the form of pre-designed scheduling templates — that you can adapt with our unique Macro Editor.

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If there are a couple of kinds of computers in your workplace, you'll want to know that using Fastback Plus on PCs is very much like using Fastback Plus for the Macintosh® — same look, same functionality.

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That's right. You can actually re-

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Nobody else can do that.

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And nobody else comes close to our level of reliability.

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Unbelievable?

That's what the people at *InfoWorld* thought.

So they "scratched both disks with the point of a knife to simulate accidental damage" and found, to their astonishment, that Fastback Plus "was 100% successful at restoring all the [damaged] files."

Still unsatisfied, they "ran the test several more times, increasing the severity of damage until we began to fear for our disk drives, but we were unable to generate a single byte of unrecoverable data."

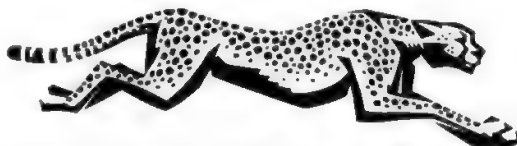
We wouldn't recommend trying this test yourself. But if you insist, you'll be glad to know that Fastback Plus is backed up by our vaunted 24-hour toll-free technical support and a one-year money-back guarantee.

There's more. So pick up the phone. Dial 1-800-677-1848.

And tell everyone to stand back.



If automated, unattended backups aren't your style, you can still enjoy unprecedented convenience with our new Express Menu, which InfoWorld considers "only slightly more complicated than an on/off switch."



FIFTH GENERATION SYSTEMS, INC

CIRCLE 288 ON READER SERVICE CARD

GeoWorks Ensemble's biggest problems: No spreadsheet is available for the environment at this time.

Microsoft Bookshelf is among the CD-ROM-based software supplied with the SX-20 CD. This reference tool includes *The American Heritage Dictionary*, *Bartlett's Familiar Quotations*, *Roget's Thesaurus*, the *U.S. Zip Code Directory*, and *The World Almanac*, among other useful titles. Another CD-ROM contains *PC-Globe*, the electronic atlas and geography database, along with *PC-USA* and a jigsaw puzzle that challenges you to piece

together maps and other images. Microsoft's *Small Business Consultant* and *Stat Pack* are on yet another included CD-ROM. Parents with school-aged children will appreciate *The New Grolier Electronic Encyclopedia*. The only questionable inclusion in the HeadStart CD-ROM library is *The Manhole*; although amusing, this is hardly the best game available in this format.

All of the SX-20 CD system's software is organized and coordinated under the

GeoWorks Ensemble environment, which has been customized by GeoWorks for this system. When an eager new user boots the system for the first time, he or she is carried directly into *GeoWorks Ensemble's* simple Welcome screen, which presents a choice of three buttons that can be clicked on.

The leftmost button, labeled "Appliances," is the most logical starting point for the neophyte. Clicking this button displays a group of push buttons that launch very modest applications, such as a calculator, a banner printer, and a



BENCHMARK TESTS: HOME PCs

When considering a PC designed for home use, you should not make performance speed your primary consideration, since these machines are specifically designed for ease of use. Even so, our tests show that some machines are both user-friendly and fast. The Magnavox HeadStart SX-20 CD benefits from a 20-MHz 80386SX processor; at the low end, the Tandy 1000 RLX lags behind with a 10-MHz 80286 processor. The other four machines are powered by 16-MHz 80386SX chips.

WHAT THE NUMBERS MEAN

Because four of the six machines run a 386SX chip at 16 MHz, there is little variation in their processor test scores. On the same test, the 20-MHz 386SX chip on the Magnavox HeadStart SX-20 CD pushed this PC into first place. Because the Tandy 1000 RLX uses an 80286 processor, it could not complete the 80386 Instruction Mix test.

The tested PCs showed a wider variation in performance when it came to

the disk test. The fastest of the six machines were the Leading Technology PC Partner XI, the Magnavox HeadStart SX-20 CD, and the IBM PS/1 Model 2121B82, which were close to each other in terms of speed. The Sun Moon Star 386SC-16/CD-ROM and Samsung Sensor SP-386SX were somewhat slower, and the Tandy 1000 RLX disk trailed all.

HOW WE TESTED

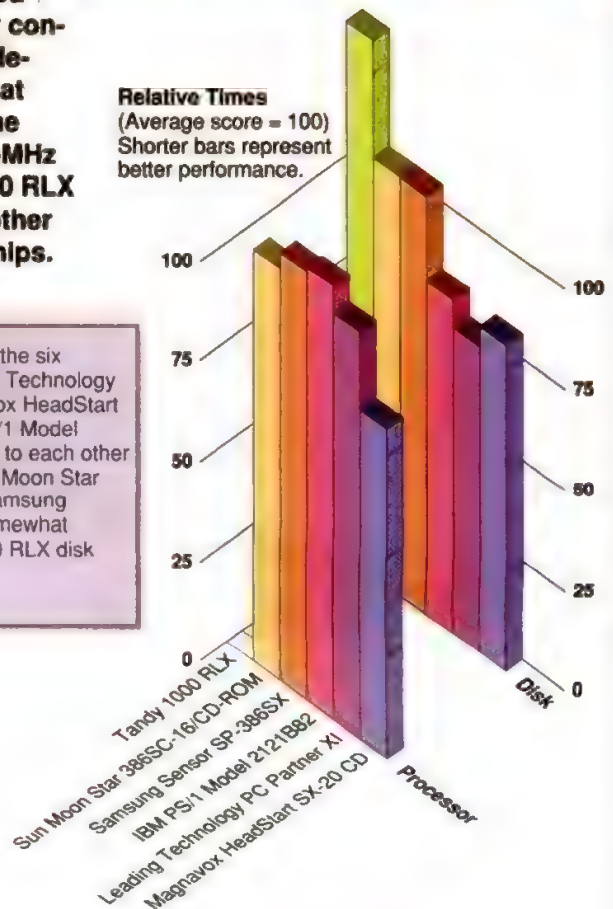
To test these six home PCs, we used PC Magazine Labs' Hardware Performance Tests, Release 5.6, with no disk caching.

The 3-D chart shows each product's performance relative to an average of the six machines' results on each test.

■ The **80386 Instruction Mix** benchmark test times a series of tasks specific to the 80386 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

■ The disk score is the sum of the small-record and large-record **DOS File Access** benchmark test times. Each test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. No software cache is employed.

Relative Times
(Average score = 100)
Shorter bars represent better performance.



Lower scores represent better performance.

	Processor (seconds)	Disk (seconds)
Tandy 1000 RLX	N/A	108.88
Sun Moon Star 386SC-16/CD-ROM	4.28	84.83
Samsung Sensor SP-386SX	4.45	85.07
IBM PS/1 Model 2121B82	4.52	67.75
Leading Technology PC Partner XI	4.20	62.09
Magnavox HeadStart SX-20 CD	3.42	66.50

N/A—Not applicable: The Tandy 1000 RLX is a 286-based PC and could not run this test.

Do You Make These Six Common Mistakes On Your Taxes?

Six common mistakes can cause you big headaches on your taxes. An oversight here, an omission there. From unnecessary tax payments to full blown IRS audits -- you can end up paying too much ... or worse.

But now, using TurboTax and your personal computer, you can avoid these simple but costly mistakes:

1 The Arithmetic Error

Today, even the simplest forms contain complex calculations. And with all the late-night scrambling, an innocent mistake could cost you plenty.

2 The Transcription Error

With all those numbers being juggled from schedule to schedule, it's no wonder the figures are so often transcribed incorrectly or entered on the wrong line.

3 The Omitted Form

Even "ordinary" returns require anywhere from six to a dozen forms to complete. It's easy to miss one ... or end up rushing all over town to find the one you need.

4 The Misinterpreted Instruction

At best, IRS instructions can be tough to understand. At worst they can be mind-boggling. What you need are clear directions in plain English.

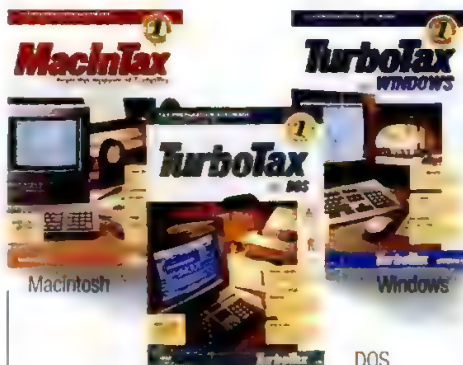
5 The Overlooked Deduction

You'd have to be a professional tax preparer to know all the deductions you're entitled to. If you miss just one, it could cost you hundreds of dollars.

6 The Exceeded Guideline

The fastest way to trigger an IRS audit is to exceed the "normal" range on one of your deductions. You need to know what the IRS looks for on a line-by-line basis.

When you do your taxes with TurboTax, mistakes like these are virtually impossible. And filing your taxes couldn't be easier.



America's #1 Tax Software

TurboTax is America's #1 best-selling tax software -- over six million returns were filed with TurboTax last year! With TurboTax on your PC (or MacInTax on your Macintosh), you can completely and accurately prepare your income taxes in just a few hours.

Here's how easy it is!

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- Enter your data into TurboTax just once.
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TurboTax does the rest. Even if your records and receipts aren't in any particular order, TurboTax guides you through step-by-step

questions and shows how to enter every item. And like a good tax advisor, TurboTax helps you identify every deduction you can claim.

Then TurboTax makes all the calculations, checks for accuracy and consistency, and transfers every number to the proper lines on the proper forms. And, TurboTax prints every form you need in IRS-approved format right on your own printer -- ready to sign and mail (or file electronically, if you prefer, for a faster refund).

PC Magazine says TurboTax "makes doing your taxes almost fun." Try it for yourself. Free. We know that if you try it, you'll never go back to doing your taxes the old-fashioned way. So we'll send you TurboTax on an unconditional free trial basis: *If you don't like it, you don't pay for it!*

Free Bonus!

Plus, when you buy TurboTax, we'll send you a FREE copy of Norton Utilities as a special bonus gift. Norton Utilities (regular \$179) is America's best-selling disk repair and data recovery program. With over 40 different types of error checking, it performs the most extensive diagnosis and repair of any utility program for the PC and Macintosh. And it's yours free when you buy TurboTax or MacInTax.



Norton Utilities

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notepad. While not very useful, these unimposing little programs provide scant opportunity for a new user to get into trouble, and they give the novice something to do right away. The notepad, for instance, allows the user to type in and print a letter; there are few formatting or editing functions to introduce confusion.

Once the appliances become boring, which should happen pretty quickly, the user can graduate to the rightmost push button on *GeoWorks Ensemble's* Welcome screen. Labeled "DOS Programs," this button takes the user into a DOS program launcher. All of the SX-20 CD's included DOS applications (as opposed to the *GeoWorks Ensemble* apps that are supplied by GeoWorks) are represented here by simple point-and-click push buttons. Having gained confidence with the simple appliances, the novice can now investigate *Lotus 1-2-3* and all of the CD-ROM apps supplied with the SX-20 CD system. One button launches an audio control program that allows the CD-ROM drive to play standard audio CDs; once a disk is playing, the program can be terminated without interrupting the sound, and the user can run non-CD-ROM software while listening to music.

After becoming fluent with the DOS launcher, the user can move on to *GeoWorks Ensemble's* Professional interface, which is accessed through the third button on the Welcome screen. A full-fledged graphical interface, the Professional screen displays icons for all the applications available under *GeoWorks Ensemble*, including the appliances, the DOS apps, and the powerful desktop publishing apps supplied by GeoWorks. Unfortunately, the SX-20 CD's lack of a modem prevents users from immediately exploring the startup kit for America Online that comes with *GeoWorks Ensemble*.

Philips provides the standard documentation that normally comes with each of the included software packages. The *GeoWorks Ensemble* User's Guide has a good introductory tutorial, and the other software titles offer tutorial material as well. In addition, a Quick Start guide helps users get their feet wet with their new system. But as the Quick Start guide itself says, it isn't a substitute for the other supplied documentation. A more extensive document that covers common problems with both hardware and the provided software library would make learning easier.

Telephone support is available five days a week via an 800 number, between the hours of 8:00 and 6:00 E.S.T. Philips says that this support line will provide answers to questions about third-party software as well as to questions about the Magnavox hardware. Users can also choose to call GeoWorks or Lotus with questions specific to those vendors' software. On-site service is provided for one year through GE Service Corp.

The SX-20 CD is not only a good home computer, it's a good computer, period. The muscular processor, commodious hard disk, and CD-ROM leave plenty of room for growth as users expand their horizons. The system does get a demerit for not supplying a modem as standard equipment, and a single unifying manual that addresses the majority of common problems would also be an improvement. The setup materials, too, could be a bit clearer. But the SX-20 CD is overall an excellent choice for anyone seeking a home computer.

SAMSUNG INFORMATION SYSTEMS AMERICA INC.

Samsung Sensor SP-386SX



Of the six machines we tested, the \$1,995 Samsung Sensor SP-386SX is the easiest to get started with. Its superb documentation was designed for users who are completely innocent of all PC knowledge. Even the rankest beginner should be able



FACT FILE

Samsung Sensor SP-386SX

Samsung Information Systems America Inc.,
3655 N. 1st St., San Jose, CA 95134; 800-
624-8999, ext. 85SP.

List Price: With 2MB RAM, 40MB hard disk,
3.5-inch floppy disk drive, Super VGA
monitor, modem, mouse, \$1,995.

In Short: The Sensor's documentation makes
setup utterly painless. A 2,400-bps modem
and Prodigy startup kit get users on-line in no
time. Original software disks are not supplied,
however, and the preloaded software may be
a bit too much for beginners.

CIRCLE 836 ON READER SERVICE CARD



Samsung delivers the Sensor SP-386SX with Microsoft Windows 3.0 already installed as the opening program, with a group window displaying the software applications that come with the machine.

to unpack and set up the Sensor in just minutes—provided he or she can follow simple instructions.

The key to this ease of setup is Samsung Information Systems' crystal-clear Read Me First! manual. Each page is divided into two easily absorbed diagrams with accompanying captions that are blessedly simple to follow. The diagrams begin—literally—with how to unpack the two boxes (one for the 80386SX-powered system unit and one for the Super VGA monitor). From there, the diagrams depict all the system components and describe how everything should be connected. Exploded close-up views of connectors and ports put the vague language and diagrams of other manufacturers' setup documentation to shame.

The setup guide is marred only by an insignificant typo or two. Everything covered in the document is duplicated in a video manual that Samsung also supplies. The video goes on to cover the boot-up process and then discusses all of the software preloaded onto the Sensor's 40MB hard disk.

One design decision on Samsung's part does seem petty when you consider the care that was obviously lavished on the package. At power-up, *The Norton Utilities* runs a system check, and then the user is prompted by a dialogue box either to back up the entire contents of the hard disk or to click No to continue. The message appears each time the machine is booted, until the user actually does the backup.

The automatic modular printer-sharing system with 128K buffer for each and every user!

With the price of today's high-capability printers, it makes sense to spread the cost among several PC users.

Yet why pay for a four-user automatic switchbox when you only have two users? And what happens if you've four users and want to add another?

Either way, don't forget to add the cost of separate buffer memory for each user – unless you want printing queues to form while one person prints.

Now, Verran's remarkable new PrinterLink system solves every one of these problems – and also cuts the cost ...

All the capability you need, however many users you have.

PrinterLink is a new system where every PC user has their own, compact sharer unit. Each connects to the next PC user's unit in a daisy-chain configuration, with the first unit connected to any parallel printer. And each contains its own buffer memory and dedicated power supply.

The result? You pay only for the printer-sharing capability you need. Add another user, just add another PrinterLink to the chain – up to any number!

An internal 128K buffer (enough for up to 64 pages of text), means queuing is drastically reduced – and mostly, completely eliminated. And each PrinterLink's internal power supply means you're no longer tied to the 20 ft parallel cable-length maximum – your PCs' distance from the printer can be virtually unlimited.

Printer-sharer, buffer memory, signal booster – add their cost together, and see just how much value the PrinterLink system offers!

Need more buffer memory?

Add a Verran BufferPack. Available in 256K, 512K and 1 MB sizes, it connects between your PC and PrinterLink, clearing data at 10,000 cps! Call for full details.



Simple to set up – and to supplement.

The PrinterLink system consists of two components: *PrinterLink 1*, which connects the first PC to any parallel printer, and *PrinterLink 2* which connects every other PC to the next in the chain.

Just plug your existing parallel cable into PrinterLink 1, and use another parallel cable (included) to connect PrinterLink 1 to the printer.

Each of the other users simply connects a parallel cable (included) from his PC to his PrinterLink 2, and connects standard RJ cable (45 ft included) to the next PrinterLink in the chain. Adding other users? Just add a PrinterLink 2 for each of them; there's no minimum or maximum limit to the number!

Throughout, data is transmitted at up to 10,000 characters per second. The result is exceptional printing speed – and the ultimate in printing flexibility!

START MAKING THE MOST OF YOUR PRINTER: ORDER TODAY!

Verran PrinterLinks come complete with a 5 ft parallel cable, 45 ft of RJ cable and one-year guarantee.

Ordering is simple: call us on our TOLL FREE number with your Visa/Mastercard number, fax us a Purchase Order or use the coupon below. Shipping and handling charges will be added to your order and delivery will be made by normal UPS, unless otherwise requested.

GEC-Marconi

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Tel: (604) 327-4335

CIRCLE 101 ON READER SERVICE CARD

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PrinterLink 2		\$150	
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ADD 4.5% Sales Tax for VA			
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COMPUTERS

HOME PCs

gendered by the personal information manager's eight tools, including a card file, phone manager, and calendar, might be considerable. A simple word processor, or a simpler integrated package such as *Microsoft Works*, might have been a better choice.

The same argument applies to *Balance Point*, the personal finance manager. A simple spreadsheet or some simpler financial apps would give the beginner something less intimidating to chew on. The Sensor lacks the bone-simple software that such systems as the Tandy 1000 RLX and the Magnavox HeadStart SX-20 CD provide.

At 3 by 13.75 by 15 inches, the Sensor's case is quite compact. With the monitor mounted on a tilt/swivel base and placed atop the system unit, the total system height comes to 15.75 inches. Even with its svelte dimensions, the Sensor makes room in its case for two full-length 16-bit expansion slots. The system comes with 2MB of RAM installed, expandable to a total of 8MB on the motherboard. There is a standard parallel port, a serial port with a DB-9 connector, and a dedicated mouse port. The Sensor is attractively priced at \$1,995, including the monitor. Street prices will probably be considerably lower, as expected for systems marketed through retail outlets.

Samsung provides six months of on-site service for the Sensor. Support for third-party software provided with the Sensor is through a 900 phone line. The first minute is free, and each additional minute costs \$1.50. Hardware problems can be reported via an 800 number. You can have any other general questions about the system answered by calling another 800 line.

The Samsung Sensor SP-386SX is an impressive effort. Its outstanding documentation makes the initial stages of setup and learning much smoother than they would be with most other systems. The inclusion of a Prodigy startup kit and an internal modem gives users a window into the wide on-line world. The failure to provide original software disks earns it a shake of the finger, however. The provided software, while of high quality and quite functional, may not represent the best possible choices for neophyte users.

Samsung's Sensor SP-386SX has plenty of power, but it doesn't go far enough toward helping new users.

That seems like a noble gesture (backing up is a terrific habit to form early) until the underlying reason for it becomes clear. Samsung does not supply original disks for the preloaded software on the system!

Not only that, the company does not even supply the blank disks necessary for the backup. In a system of this quality, it seems inconceivable that the manufacturer wouldn't provide the original disks, as the vendor of every other machine in this roundup did. The user is forced to go out and get blank disks in order to have copies of the supplied software. This is not a good way to start.

The system boots directly into *Microsoft Windows 3.0*, running under DOS 4.01. Other software titles on the Sensor's disk include *Your Way* (a *Windows* personal information manager) and *Balance Point* (a personal finance manager that is also a *Windows* app). Also provided are *The Norton Utilities*, Version 5.0, and *The Norton Backup*, along with a Prodigy startup kit to give users something to do with the Sensor's internal 2,400-bps modem. All of this software is presented in a single program group, which opens when *Windows* boots. In the same program group resides an elaborate system tutorial that supplements the print and

videotape documentation, which helps users get going.

The tutorial makes beautiful use of the amenities of the *Windows* environment. Users first select an icon from the tutorial's main screen for one of its four chapters: System Introduction, Hardware, Software, and Roadmap. The latter is actually an alphabetized list of topics that you can click on to select specific sub-topics.

Once a topic has been selected, either by following the tutorial sequentially or by directly selecting a topic from the Roadmap section, a text box displays the tutorial material. The information is accompanied by high-quality graphics images that illustrate the concepts under consideration. Users can easily navigate within a topic by clicking on symbols that closely resemble the transport controls on a tape recorder or VCR.

Using the tutorial profitably takes a little practice, both to get used to the interface and to develop an active approach to answering specific questions.

Samsung's choice of applications seems a bit idiosyncratic. The only word processor provided, aside from *Windows Write*, is the Page component of *Your Way*. For a beginner, the confusion en-



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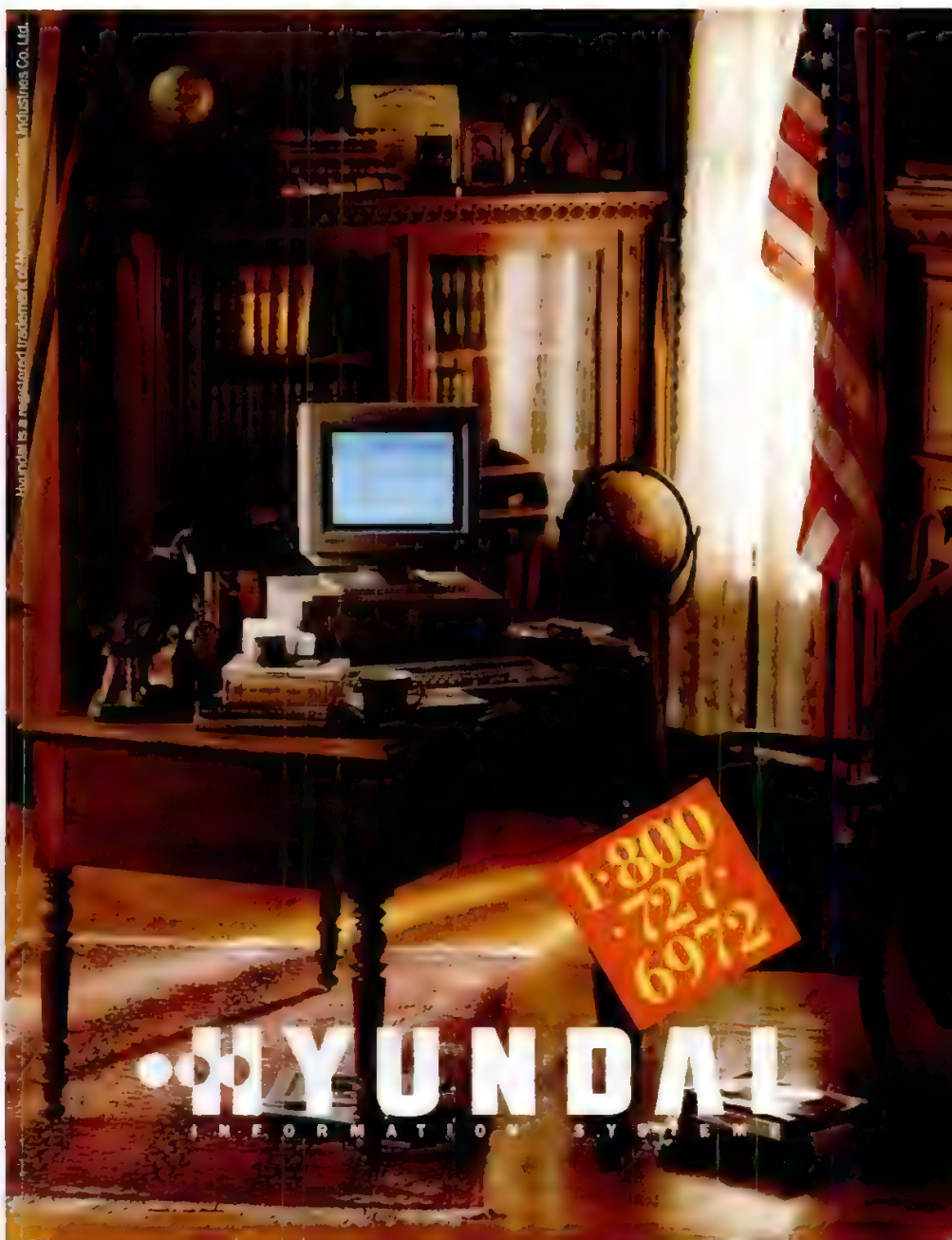
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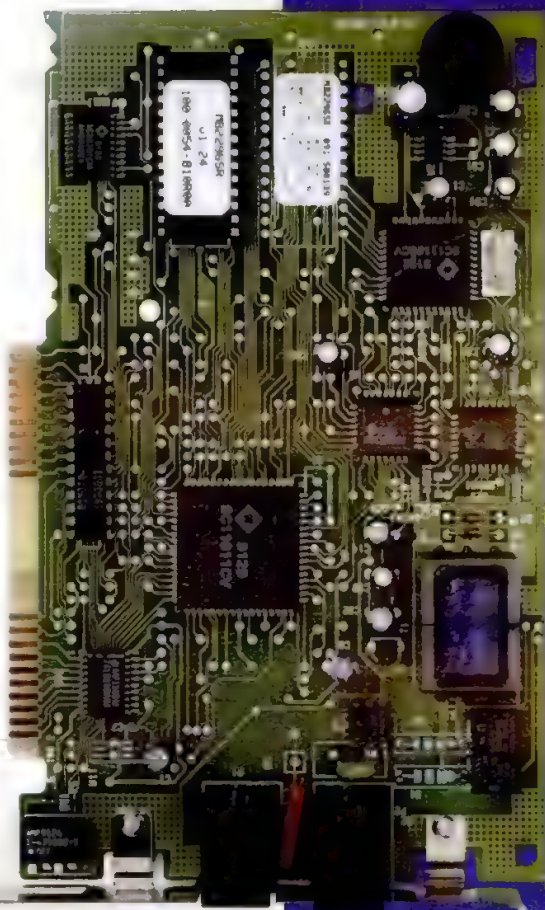
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SUN MOON STAR Sun Moon Star 386SC- 16/CD-ROM



Hardware and software are only 50 percent of a home computer. The way the company presents the system to the user, who will most likely be a PC novice, is equally important. The system must be easy to set up, and the preloaded software must be presented in such a way that the beginner can use it. The Sun Moon Star 386SC-16/CD-ROM offers a good combination of hardware and software, and at a reasonable price. Considerable effort obviously went into the supporting documentation and other materials. But our evaluation unit had some flaws that would probably prevent all but the most persistent neophyte user from getting the most out of the system.

Sun Moon Star produces two basic systems for the home market. Like the Magnavox HeadStart SX-20 CD, both Sun Moon Star systems come with internal CD-ROM drives and an assortment of CD-based software. The 12-MHz 80286-powered version (suggested retail price, including VGA monitor, is \$2,595) comes with the *GEM* graphical operating environment and applications, including *GEM Draw* and Central Point Software's *PC Tools*. Sun Moon Star's 16-MHz 386SX model, with a VGA monitor, carries a suggested list price of \$2,995; with a typical 25 percent retail discount, street

PC FACT FILE

Sun Moon Star 386SC-16/CD-ROM

Sun Moon Star, 1941 Ringwood Ave., San Jose, CA 95131; 408-452-7811.

List Price: With 2MB RAM, 40MB hard disk, 5.25-inch floppy disk drive, internal CD-ROM drive, VGA monitor, mouse, \$2,995.

In Short: This Sun Moon Star product offers a CD-ROM software bundle much like the one provided by Philips Consumer Electronics Co. It substitutes *Microsoft Windows* for *GeoWorks Ensemble*, however, and lacks the polish and ease of setup of the Magnavox HeadStart SX-20 CD. If Sun Moon Star improves the documentation, its 386SC-16/CD-ROM will be a machine well worth checking out.

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prices could be between \$2,200 and \$2,300, putting the system into direct competition with Philips' faster SX offering.

The 386SC-16/CD-ROM comes with *Microsoft Windows* instead of *GEM* preloaded on-disk. The hard disk-based software is rounded out by *PC Tools* and Touchstone Software Corp.'s *CheckIt*, a system diagnostic and testing package.

The provided CD-ROM software includes *Microsoft Bookshelf*, *Small Business Consultant*, and *Stat Pack*. Software Toolworks' *World Atlas* is also part of the package, as is *Software Toolworks Illustrated Encyclopedia*. A single CD holds *Hotline II Executive* (a phone database and management system) and an assortment of games. *CD Guide, Optical Edition*, is a database of 50,000 audio CD titles and related information, including critical reviews of many titles. Sun Moon Star also makes the CD-ROM software assortment available with an external CD-ROM drive, for a total suggested list price of \$995.

Our evaluation unit came with some fairly elaborate setup documentation in addition to manuals for all of the provided third-party software. A Getting Started manual and video are intended to smooth

the process of setting up the hardware and introducing the user to the hard disk-based software. A CD-ROM demo disk serves the same purpose for the CD-based software.

Unfortunately, it appears that all of this



Sun Moon Star offers home systems with either *GEM* or *Microsoft Windows*; unfortunately, it provides only one tutorial, which focuses on *GEM* and not *Windows*.

material was intended for use with the 286 system, which includes *GEM* instead of *Windows*. The Getting Started manual and video do a good job of helping the user unpack and make the necessary cable connections, but the information provided on the software is just about useless to owners of the *Windows*-based SX system. They do touch briefly on *CheckIt* and *PC Tools*, but only in the context of a *GEM*-based system. For a complete novice, this is far from helpful.

The CD-ROM demo, while also obviously intended for the 286 system, is more useful. It takes the user through a brief interactive introduction to the major CD-ROM apps. The demo talks to the user through a pair of modest speakers, supplied by Sun Moon Star, which you attach to the ROM drive's headphone jack. The setup materials don't mention the speakers or how to connect them, and worse yet, our system arrived without the demo CD installed on the system. To install the demo, we had to go to DOS and follow a crude setup interface in order to configure it properly. Needless to say, a beginner couldn't be expected to cope with a situation like this.

This lack of attention to detail was obvious in the *Windows* desktop setup as well. *PC Tools*, the only significant general-purpose software provided, has three main modules. Two of them, a DOS shell/file manager and a backup program, had icons installed in the desktop. The third module, which has such important apps as a notepad, an outliner, and a modest database, had no icon. Once again, an inexperienced user would have to figure out how to install the icon or access this program through DOS, which defeats the whole purpose of the graphical user interface.

The sense of inadequate presentation was enhanced by the defective mouse supplied with our demo: It worked fine along one axis but barely moved the pointer along the other.

The 386SC-16/CD-ROM comes with 2MB of RAM and a 40MB hard disk, which is considerably smaller than the 80MB disk that is standard with the comparable Philips system. The roomy 6.5- by 14.75- by 16.5-inch system unit has one 8-bit slot and two 16-bit slots available as configured, and a drive bay is available for users who want to add a 3.5-inch floppy disk drive to complement the 5.25-inch drive that comes with the system. A single parallel port and two DB-9 serial ports are provided.

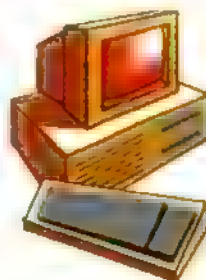
The system comes with a three-year warranty; on-site service is provided through Nationwide Warranty Corp. for the first year. Service is free or provided at a mileage charge, depending on the distance that service personnel must travel. During the second and third year of the warranty period, service is from Sun Moon Star. The company estimates a two- to three-week turnaround time in most cases. Users pay for shipping to the service center; Sun Moon Star pays the return shipping charge.

Sun Moon Star provides telephone support for DOS and *Windows* and will answer basic questions about other third-party software. Support is available Monday through Friday, 7:30 to 5:00 P.S.T. For more-complex problems with software other than DOS or *Windows*, Sun Moon Star will refer users to the original vendor.

The company promises that the documentation and supporting materials will be completely reworked by the time this article is printed. If it follows through, the Sun Moon Star 386SC-16/CD-ROM will be worth consideration for home use. In the meantime, it appears to be less than the sum of its generally excellent parts.

TANDY CORP.

Tandy 1000 RLX



The Tandy 1000 RLX home PC is a complete package. This machine is well thought out, offers advanced sound capabilities, and includes the popular low-end



FACT FILE

Tandy 1000 RLX

Tandy Corp., Radio Shack Division, 1800 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.

List Price: With 1MB RAM, 40MB hard disk, 3.5-inch floppy disk drive, VGA monitor, mouse, \$1,828.95.

In Short: Tandy's 80286-powered home system is replete with software for the whole family, all of it neatly unified under the *DeskMate* interface. It lacks the power and expandability of the other machines considered here.

graphical interface, *DeskMate*, in ROM. But the 1000 RLX is the only 80286-based machine we looked at for this story, and its 10-MHz processor leaves little room for growth into ambitious graphical applications, or even into today's more advanced 256-color game software. Its 40MB hard disk will likely be ample to keep most beginners happy for some time, but several other machines in our test group offer considerably more storage. Its standard RAM complement of 1MB is also the smallest among the machines we reviewed.

For what it gives you, the 1000 RLX is not particularly inexpensive. The suggested list price for the system is \$1,199.95. The VGM-300 VGA monitor that arrived with our test unit adds a stiff \$629, bringing the total system price to \$1,828.95. While Tandy Corp. runs frequent sales, its products usually sell at list price. That places this system very close to the likely price points for some of the 386SX systems reviewed here. Tandy does offer the system in conjunction with its VGM-220 VGA monitor, for a total system price of \$1,399.90.

The 1000 RLX has an admirably compact case; its dimensions are 3 by 14 by 15 inches. With the monitor parked on top of the system unit, the total system height is 14.75 inches. The compactness of the case has its disadvantages, however; there is no internal CD-ROM option offered for the 1000 RLX, and the slim-line case will not accommodate one, according to a Tandy spokesperson. It's a shame our review unit lacked a modem: *DeskMate* includes software for accessing Tandy's PC Link on-line service as well as free connect time, which users could use to explore the service. You can add an optional 2,400-bps half-card internal modem for \$99.95.

The system comes with one parallel and one serial port, a dedicated mouse connector, and two joystick ports. The VGA graphics adapter is on the motherboard. Also on the rear panel of the system unit are a microphone input jack, a headphone output jack, and a volume control for the 1000 RLX's built-in music and sound capability.

The Quick Start card uses six easy-to-follow diagrams clearly describing how to set up the 1000 RLX. Once the monitor, keyboard, and mouse are attached, the user simply turns on the monitor and CPU and *DeskMate*'s desktop shortly appears.

Preloaded on the disk is a very slick

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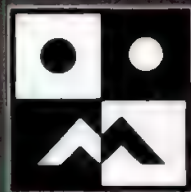


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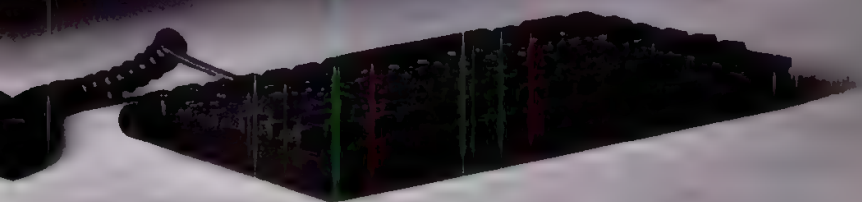
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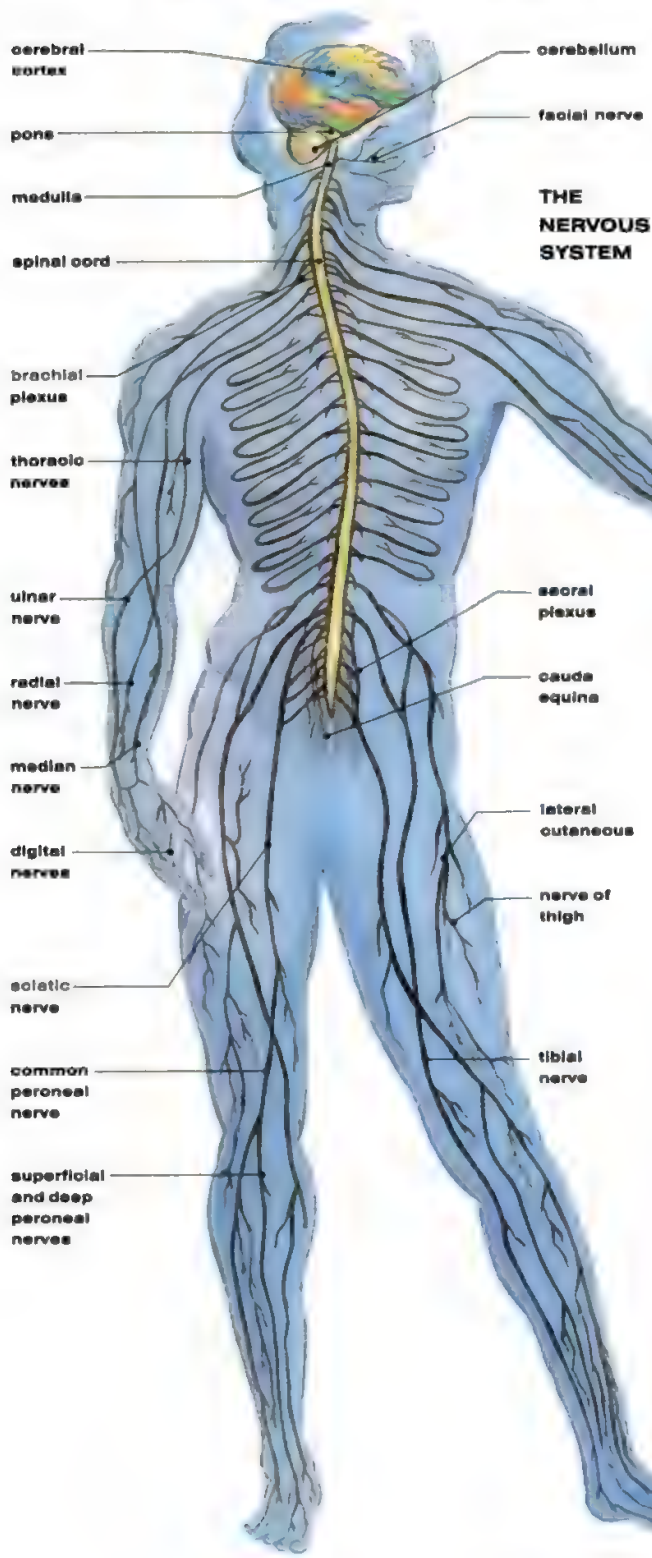
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demo, which effectively demonstrates the system's sound recording and playback capabilities, its VGA graphics, and its included software. Members of a hypothetical family discuss their uses of the machine; the demo displays digitized photos of each family member and plays recorded narration from each of them. As they describe what they do with the 1000 RLX, the demo shows the software in action.

DeskMate includes a good interactive tutorial that introduces the preloaded software. You access it simply by clicking on a button marked "Teach Me." The tuto-



The Tandy 1000 RLX uses *DeskMate* as its shell. The demo of the system's capabilities uses spoken voices and shows how to use the record and playback features.

rial is broken down into a series of topics, including a tour of the *DeskMate* interface itself. Several other topics focus on the home organizer programs that Tandy includes with the system. The tutorial introduces these ultrasimple-to-use mini-apps in a slow-paced, patient, and forgiving manner. More-sophisticated *DeskMate* software, such as the Draw program and the Text word processor, is also introduced.

The home organizer programs provide tools customized for a household environment, thereby making the 1000 RLX useful right away. These are divided into Personal, Financial, and Kitchen categories. The Personal programs include a database designed to organize collections, a diary (with password protection for individual users), and a home inventory, among other tools. The Financial category breaks down

tasks that could be done in a spreadsheet—expense tracking, for example—into simple template-driven screens. Among other things, these screens calculate the amount you must save each year to reach a certain goal, or the monthly payment on a loan given a principal amount, an interest rate, and a repayment period. The Kitchen category offers culinary aids, such as a recipe file and a meal planner.

The Information Center button on the *DeskMate* desktop reveals a screen with a simple scheduler, a scratch pad, and most intriguingly, a bulletin board that accepts text or spoken messages. Recording and playing back spoken messages is truly simple; unfortunately, Tandy doesn't include a microphone as standard equipment. That seems strange, since it does provide the recording and playback technology.

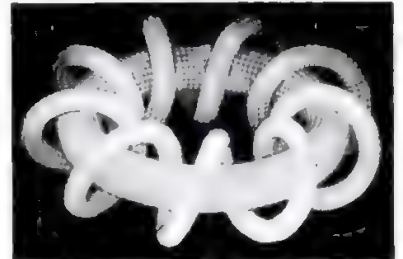
The sound component offers three voices and comes with an 8-bit DAC (digital-to-analog converter). Two *DeskMate* programs, Music and Sound, allow exploration of the sound facility. The Music module comes with sample composition files that can be loaded and played back. You can also enter music into a simple editor and print it out as standard musical notation. The Sound module allows input and modification of recorded sounds, which you can then use as instrument voices in the Music application.

Service and support are provided on a walk-in basis at local Radio Shack outlets. That seems less elaborate than the arrangements provided by the other manufacturers in this roundup, but it is worth remembering that there are literally thousands of Radio Shacks from coast to coast.

The Tandy 1000 RLX is a true home PC: Everything about it seems carefully designed to function in a home environment. Its built-in software is simple and unimposing to learn, and *DeskMate* has spawned a host of more-powerful applications, including a *Lotus 1-2-3* spreadsheet, that are available for Tandy's graphical user interface. Unfortunately, its modest power and expandability—with only one expansion slot—severely limit the 1000 RLX's growth potential and limit users to software that stays within the system's means. ■

Jonathan Matzkin, a former associate editor of PC Magazine, is currently writing a book about Qmodem.

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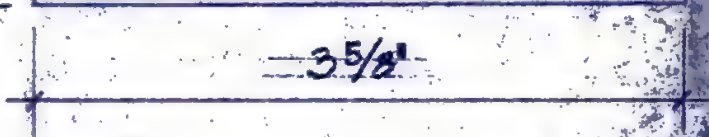
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GRAPHICS



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by Jeff Prosize

Few industries have been transformed by computer software as dramatically as the worlds of architecture and engineering have been revolutionized by computer-aided design (CAD). In less than a decade, rows of traditional drafting tables have given way to dimly lit electronic workspaces where drawings are crafted electronically with pixels of light.

This remarkable transformation, sparked by the development of costly and complex software for engineering workstations, has blossomed with the proliferation of inexpensive but sophisticated CAD software for the PC. Today, packages costing a few hundred dollars can do

the work of software that cost thousands just five years ago.

The last time we reviewed low-cost 2-D CAD software, we found the packages then on the market useful if somewhat limited ("Upwardly Mobile CADD," *PC Magazine*, December 8, 1987). How times have changed! Today's crop of low-cost CAD packages have serious muscle—and they're getting better every day.

To do serious CAD work back in 1987, you could expect to invest more in the software than you did in your PC. Not any more. While many large, well-heeled engineering firms still stick with *AutoCAD* and its top-of-the-line competition, the affordability and power of today's low-end CAD software make CAD a viable option for a much broader community of users. If you don't need the most sophisticated features of the most sophisticated CAD software—3-D modeling or *RenderMan*-style photo-realistic rendering, for example—the under-\$1,000 packages reviewed here will serve you well for a long time to come.

WHAT IS CAD... AND WHY?

Computer-aided design (sometimes called CADD, for *computer-aided drafting and design*) reduces the time and cost associated with creating, editing, storing, and transmitting mechanical and engineering drawings by casting them in electronic form. Drawing electronically is faster than drafting manually, because redundant parts of the drawing process (such as placing symbols) are automated. When changes are needed, CAD drawings can be edited quickly, because entities on the screen are easily modified or erased; as in word processing, you change only what needs changing. Further, CAD drawings can be archived on-disk rather than in space-consuming storage vaults, and transmitted—across the room or across the country—over ordinary phone lines rather than by paper mail.

CAD systems with 3-D capabilities can generate lifelike images modeled on the original drawings, enabling engineers

and designers to visualize designs before they make the long and costly journey from the drawing board to the manufacturing floor. Some CAD packages also automate the creation of many design by-products that formerly required as much time as the design itself. These items include bills of materials, parts databases, and numerical-control machine tapes that guide the production of parts on milling machines and lathes.

CAD replaces pencils, rulers, drafting triangles, and T-squares with electronic tools that bring greater precision and ease of use to the crafting of complex drawings. To create an entity (a line, circle, arc, or other curve), you designate the points that define it (for example, the endpoints of a line), and the system draws the entity between or around them. Applying a dimension is as simple as selecting the points whose distance you want to indicate. If the points change, the dimension changes, too, thanks to a recent advance called *associative dimensioning*.

To help you place points precisely, CAD programs let you enter coordinates, set up on-screen snap grids, or snap to pertinent points in existing geometry such as the center points or endpoints of lines or the centers of circles. Move and Copy commands let you reposition entities on the page. Symbols—commonly used objects such as door swings or windows in an architectural drawing—can be applied wherever needed with a couple of clicks of the mouse.

Moving around a CAD drawing is similar to moving around in a spreadsheet: Your display screen serves as a window that can "pan" to any part of the drawing. CAD software offers the additional capability of zooming in or out for a more or less detailed view. You can select the drawing scale and units of measurement (such as inches, feet and inches, or millimeters), and the program will adapt automatically. When you're ready for hard copy, merely select the output device (usually a plotter or laser

printer), tell the program how many copies you want, and watch it go to work.

Many CAD programs also automate such analytical tasks as calculating areas and moments of inertia. Skillfully applied, CAD can cut the time required to go from concept to finished drawing by a significant margin; it can reduce the time spent editing drawings even more dramatically.

We are on the threshold of some exciting new developments in low-end CAD. We can expect such innovative features as associative detailing and parametrics to migrate downward from the more exalted levels of CAD, where they are now appearing, to the mainstream market. With associative detailing, if a part is changed in the main drawing, the geometry of any detail views extracted from it will change correspondingly. Parametrics allows the draftsman to enter critical dimensions as variables and shape the geometry on the fly by supplying values for those dimensions later. (For more detail, see the sidebar "Parametrics: A Revolution in Computer-Aided Design.")

LOW-END VS. HIGH-END CAD

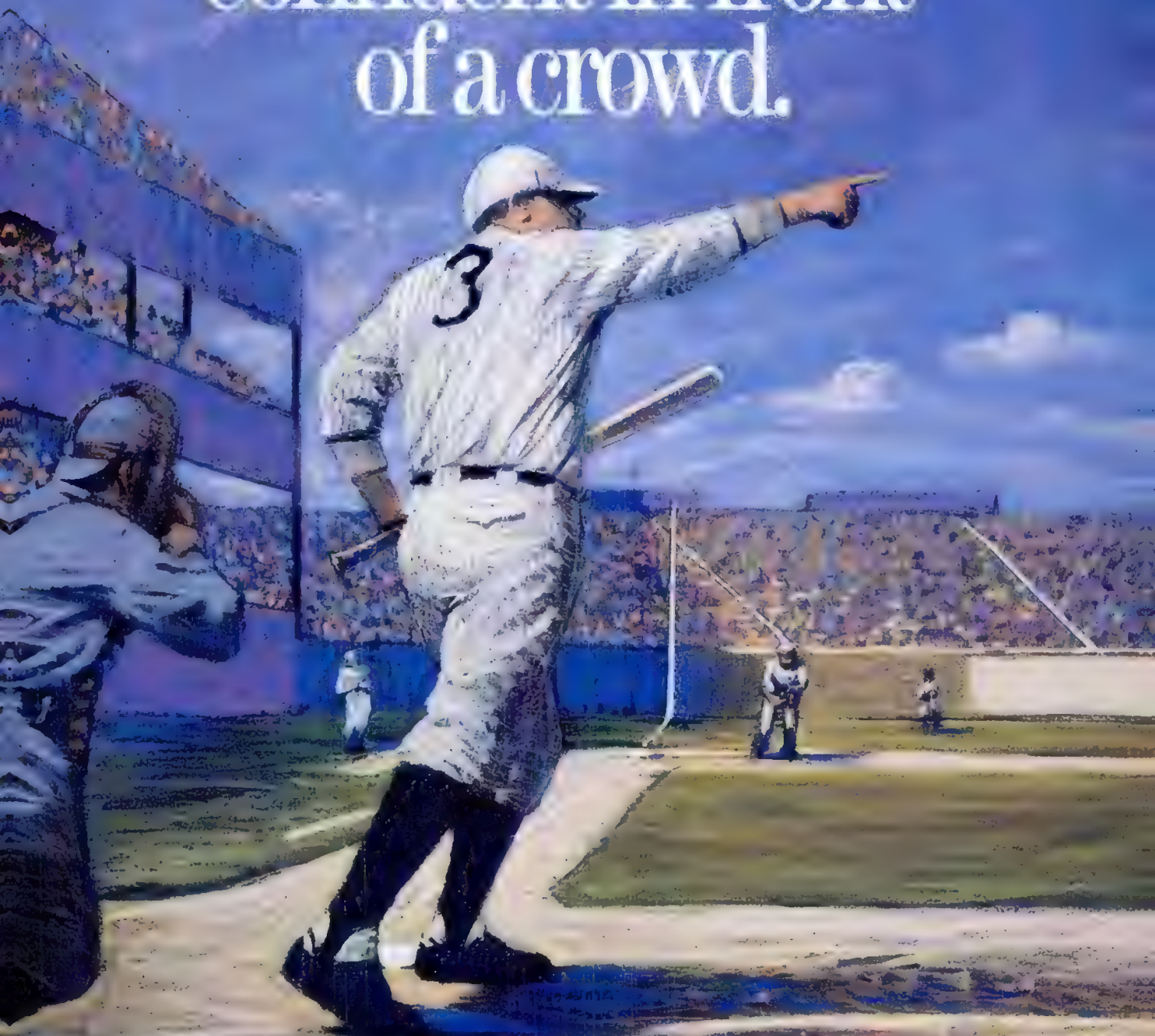
This review focuses on the lower end of the CAD market. To fit our selection criteria, a program has to provide basic drawing primitives (such as lines, arcs, and circles), dimensioning, text annotation, and hatching. It has to be able to create drawings up to E-size, take advantage of extended or expanded memory to avoid limitations on the size of a drawing, and support VGA video. And it has to cost less than \$1,000—the price point that seems to separate the low-end from the high-end market.

Our team of reviewers took in-depth looks at ten CAD packages: *AutoSketch*, *CasCAD III*, *DesignCAD 2-D*, *Drafix CAD Ultra386*, *Drafix Windows CAD*, *Draft Choice*, *EasyCAD 2*, *FastCAD*, *Generic CADD*, and *Point Line Drafter*. Eight others—*CAD One*, *CD CAD*, *Cedar CADD*, *DesignMaster*, *LaserCAD Professional*, *PC-Draft-CAD*, *Sonnet-CAD*, and *TurboCAD*—were not included because they were not received in time for review or did not meet the requirements outlined above. *Ashlar Vellum*, one of the most interesting 2-D CAD products on the market, was dropped because shortly after our testing began, Ashlar raised its \$995 list price by a whopping \$1,000, thus placing it well outside our price limit.

High-end packages offer any or all of

If you don't need the features of the most sophisticated CAD software, an under-\$1,000 package will serve you well.

It's been 59 years
since anyone's felt this
confident in front
of a crowd.



*In the 1932 World Series, with the Cubs calling him anonymously
from the bench, Babe Ruth boldly pointed to the center field bleachers and
to predict the flight of the ball. On the next pitch, he hit it there.*

Introducing Freelance Graphics for Windows.

*Expect your next
business presentation
to be a big hit.*



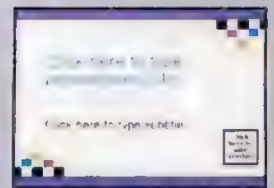
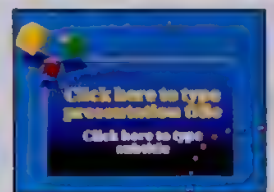
Now you can be more confident that your next presentation will be as big a hit as Babe's was 59 years ago. That's because the new Freelance Graphics™ for Windows™ does most

of the work for you. Which is why so many people are applauding it already. All you do is think about what you want to say. The program actually coaches you as you go along.

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Whether it's color or black-and-white overheads, handouts or 35mm slides, Freelance Graphics reaches new heights in output quality. You can even display colorful Screen Shows right from your PC's monitor.



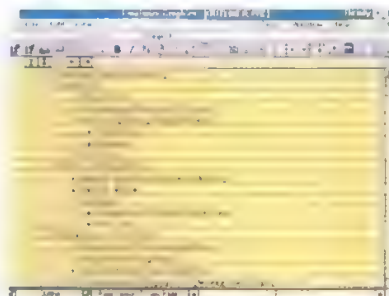
*1. **Select the look.** And let SmartMasters do the design work for you. Of course, you can still customize the look any way you choose.*

step—through the process of creating a stunning presentation. Which means in minutes, you'll be confidently swinging away. What's more,

Freelance Graphics for Windows features SmartMasters™, which automatically manages the design and layout of your presentation for you. Just select a design you like

and SmartMasters shows you where to place your text and graphics. Just like Babe pointed to centerfield and, as the story goes, hit it there.

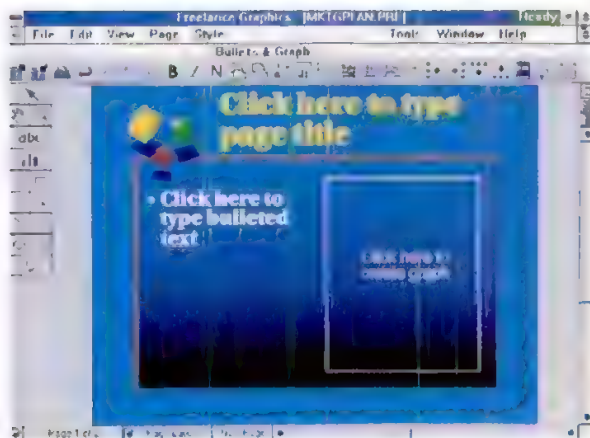
The fully-integrated set of Smart Features further automates the process. For example, the Outliner lets you organize your key points the way you would on a pad. Smart Charting automatically composes



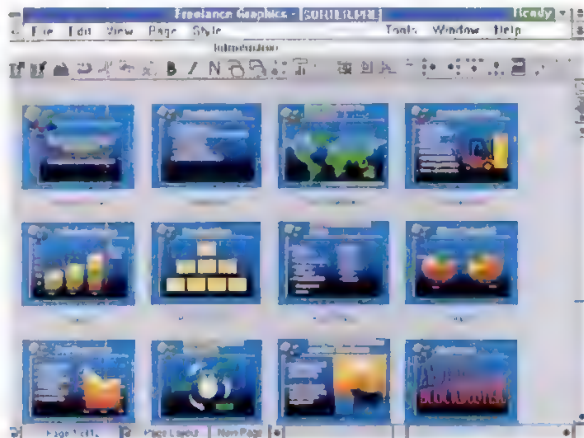
*Use this view to outline your points.
As you type, SmartMasters create presentation
pages for you automatically*

your most frequent tasks. Along with full integration that allows it to work together with all our Windows products.

So, if you want to be a heavy hitter, let Freelance Graphics—your presentation partner—guarantee your success from start to finish. Who knows,



2. Fill in the blanks at the prompts.
Add your message or place your graphs where indicated on the screen.



3. See the big picture in Page Sorter.
Add, delete, re-arrange or combine pages from other presentations and you're ready to go.

data charts to fit the available space. And the Symbol Gallery offers you over 500 full-color clip art images that you can view and select on-screen.

Of course, like Lotus® 1-2-3® and our other Windows products, Freelance Graphics features SmartIcons™, the unique "one-click" short-cuts for automating

the next pitch you handle could be your most memorable one, too. To purchase your copy of Freelance Graphics for Windows, contact your Lotus Authorized Reseller today. For a free auto-demo or to upgrade from any graphics package, please call **1-800-872-3387, ext. 6341.***



Freelance Graphics for Windows



PARAMETRICS: A Revolution in Computer-Aided Design

by Jeff Prosis

The latest breakthrough in the already revolutionary field of computer-aided design is slowly but surely working its way down from the workstation world to the PC platform. It's called parametric design, and it promises to streamline the design process in the nineties the same way CAD transformed drawing procedures in the seventies and eighties.

In parametric or dimension-driven design (formally known as dimension-driven variational geometry), any or all of the drawing geometry can be dynamically linked to adjustable parameters. This lets you specify the final size and shape of an object by entering values for its dimensions after you have drawn the geometry. As a simple example, you could draw a circle on the screen quickly with an approximate diameter. But then when you have entered a precise diameter dimension (say, 2 inches), the circle would be redrawn to that size. If at a later time you needed to resize the circle, you would only have to enter a new dimension for the diameter.

Perhaps more important, parametrics lets you define relationships between specified elements of the drawing—relationships that can be maintained throughout the design process or altered as necessary. For example, if you draw a rectangle and specify that the height should always be twice the width, then any time you change the dimension value for the width, the rectangle will automatically be redrawn, maintaining the predefined 2:1 height-to-width ratio.

Sounds nice, you say, but hardly revolutionary? Be assured that there are far-reaching implications of parametric design that may not be immediately apparent: Parametric CAD allows a designer to play "what if" with

geometry the same way a spreadsheet lets an accountant experiment with rows and columns of numbers. For an engineer striving to optimize a design by fine-tuning parameters that impact other parts of the design, or to explore the relationships between moving parts, parametrics can potentially cut calculation and regeneration times by a factor of 10.

Vendors have taken different approaches to implementing parametric design on the PC. Some CAD programs now feature parametrics as part of their basic toolset. One such pro-

gram is *Ashlar Vellum* (the diameter). *Vellum* supports a wide range of mathematical operators for these expressions, including square roots, exponents, logarithms, absolute values, trigonometric functions, and then some.

Once the dimensions are in place, you can enter values for any variables you defined by highlighting the appropriate geometry and its dimensions and selecting Resolve from the program's Edit menu, which pops up a dialog box containing a text entry field for each variable. As you enter values, *Vellum* redraws the geometry to the specified dimensions.

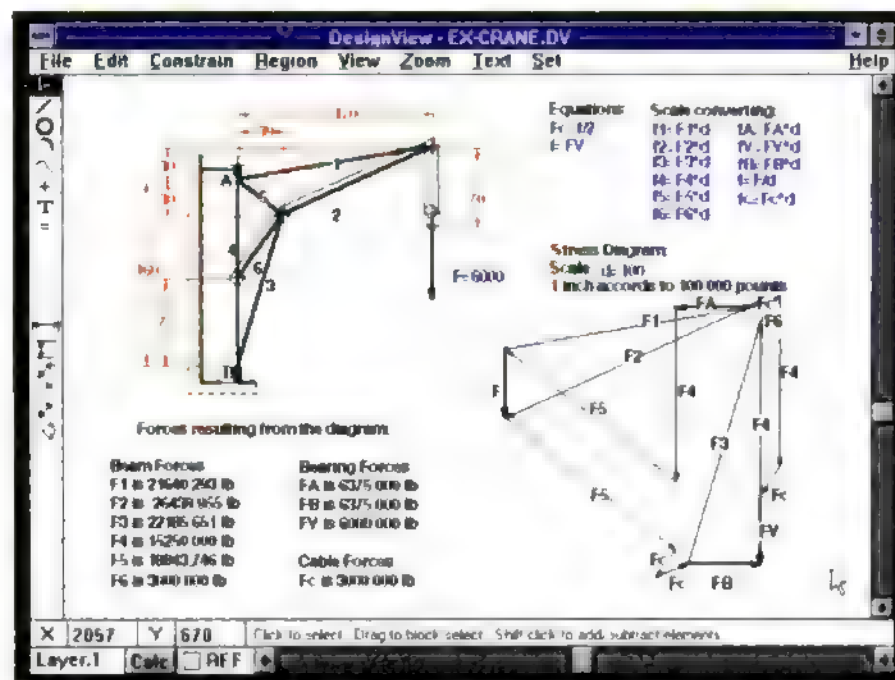
If you wish, you can also dimension symbols parametrically with *Vellum*, specifying values for them after they are imported into your drawing. This gives greater control over symbol sizing and placement than is possible with packages that restrict you to scaling and rotating symbols when they are first brought in.

DRAWING BY EQUATION

While it is also a capable drawing program, *DesignView*, Version 2.0—an \$895 product from Computervision—exploits parametrics specifically as a sophisticated analytical tool. Like *Ashlar Vellum*, Computervision's *DesignView* permits you to sketch a part and then specify exact dimensions

later. Both packages also let you create equations that define the interrelationships between various parts of the drawing, and apply geometric constraints so that, for example, a circle will remain tangent to a particular set of lines no matter where those lines are moved.

DesignView doesn't stop there. Once the governing equations are set up, it will automatically step a variable through a range of values in fixed user-specified increments, redrawing the



DesignView's parametric features can be used to construct a model that computes the forces in the structural members of a crane resulting from a vertical applied load. Changing the value of the load recomputes the results displayed in the lower-left corner of the screen.

gram is *Ashlar Vellum* for MS-DOS with Windows 3.0, a highly touted \$1,995 2-D CAD package manufactured by Ashlar.

To define a part parametrically in *Vellum*, you sketch the geometry, then use the dimensioning tools to apply dimensions so that the geometry is unambiguously defined. A dimension value can be a constant (such as 2.00 centimeters), a variable (such as Dia, short for diameter), or a mathematical expression (such as 2*Dia, for twice

screen image after each iteration and optionally superimposing new images over the old to generate a record of motion. You can also animate images by using the program's Movie feature, which takes snapshots of screens and plays them back in sequence to create the illusion of motion. For those who need help in defining governing equations, *Premise* offers a separate module called *DesignView Applications Library* that contains canned solutions for more than 200 common engineering problems.

For good measure, *DesignView* also includes an arsenal of analytical features, including the ability to calculate areas, centroids, and moments of inertia. And *DesignView*'s built-in equation solver handles a wide range of problems, from simple linear equations to systems of simultaneous nonlinear equations. You can use it to solve equations whether or not they are linked parametrically to drawing geometry. For example, it is a simple matter to solve the simultaneous equations

$$\begin{aligned}(3*x)+(4*y)&=11 \\ (5*x)+y&=7\end{aligned}$$

for x and y (the answer: $x = 1$, $y = 2$); you just type the equations into the current worksheet and let *DesignView* determine what combination of values will produce the specified results. If either variable is referenced in a dimension, the geometry will automatically change to reflect the solution. The solver supports a wide range of mathematical functions, including functions for calculating trigonometric quantities, square roots, logarithms, and exponents. It also supports user-defined functions, if-then-else clauses, and statements that will alert you when specified conditions are met; for example, it will tell you when the value of a variable exceeds a predetermined limit.

The screenshot on the facing page

illustrates one possible application for *DesignView*. Here, the forces in a crane resulting from a vertical applied load are computed by means of a force diagram, where the length of each vector is proportional to the force in each member. The equations that govern the model appear in the upper-right corner, the results at the lower left. Changing the applied load, F , recomputes the forces. By the same token, you could easily experiment with different crane designs by varying the lengths and dimensions of the crane's members. And by using the *Windows* Clipboard to paste your calculations and images into a word processor, you could document your analysis with a minimum of extra effort.

In the future, we can expect to see more and more CAD vendors integrate parametric design capabilities into their products. Parametric design is still in its infancy on the PC platform, but it holds the promise of enormous benefits for mechanical engineers and designers.

Ashlar Vellum for MS-DOS with Windows 3.0

Ashlar Inc., 1290 Oakmead Pkwy., #218, Sunnyvale, CA 94086; 408-746-3900.

List Price: \$1,995.

Requires: 386SX-based PC or better with math coprocessor, 4MB RAM, 5MB hard disk space, *Microsoft Windows 3.0*, *Windows 3.0* video driver, DOS 3.3 or better, *Microsoft-compatible* mouse.

CIRCLE 633 ON READER SERVICE CARD

DesignView, Version 2.0

Computervision, 100 Crosby Dr., Bedford, MA 01730; 800-888-7736, 617-275-1800.

List Price: \$895.

Requires: 386-based PC or better, 2MB RAM (4MB recommended), 5MB hard disk space, *Microsoft Windows 3.0* or better, mouse. Math coprocessor recommended.

CIRCLE 634 ON READER SERVICE CARD

the following features that lower-end packages tend to lack: 3-D modeling, photo-realistic rendering, built-in programming languages, the ability to link in external routines written in lower-level languages, network support, and extensive value-added reseller (VAR) support. In general, the low-end packages draw in two dimensions only, and they tend to be less rich in features and less extensible through third-party add-ons.

The line between low-end and high-end CAD, however, is rapidly blurring as low-end packages become more powerful. American Small Business Computers' *DesignCAD 2-D* and Autodesk Retail Products' *Generic CADD*, for example, offer just about everything the big boys do except for 3-D—and 3-D versions of both packages are available for those who need it (see "Low-Cost 3-D CAD: Modeling for the Masses," December 11, 1990). But the preponderance of CAD work today is done in 2-D; a sizable universe of CAD users simply do not need the features the \$3,000-and-up packages offer. For organizations that deal primarily in floor plans, electrical schematics, facilities design, or other domains that are appropriately represented in two dimensions, a full 3-D package may be overkill.

Furthermore, some low-end packages are better than any of their pricey competitors at certain important tasks. No package anywhere along the cost spectrum, for example, does double-line walls, fills, and trims better than *Generic CADD*—a point to consider if your work involves a lot of floor plans. And you shouldn't assume that costlier packages are faster. When it comes to speed, *Evolution Computing's FastCAD* runs rings around software costing several times as much.

HARDWARE REQUIREMENTS

Because CAD programs are both graphics- and computation-intensive, they tend to tax your hardware more than most programs. Although most of the packages we reviewed will run on an 8088 or 8086, such computers are too slow to be useful. At the very least, you will want a fast 286 to run these programs. A 386 is better, and a 486 better still—though certainly not required.

Of the packages we reviewed, only *FastCAD* requires a math coprocessor, but trying to get by without one is a mistake. As our benchmark tests show, a math chip typically delivers a four- to

In the
last year,
Lotus created
six new
spreadsheets.

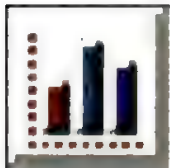
And
for what?

For Wi

**The new Lotus 1-2-3 for Windows.
It's pure Windows and pure 1-2-3.**

Six new spreadsheets that work together across a variety of platforms so that your organization can work together better than ever before. That's what 1-2-3* has been up to lately.

For starters, there's 1-2-3 for Windows,[™]
a full-fledged Windows application



These fully customizable SmartIcons give you push button access to basic and advanced spreadsheet functionality. Just by pointing and clicking the mouse. For example, sum a column or a row or change text to bold, all in a single step.

with innovations that deliver a wonderful balance of power and simplicity. Not to mention full compatibility with all earlier versions of 1-2-3.

But it's not just 1-2-3 running on Windows. It's 1-2-3 taking full advantage of it. For example, with its innovative use of SmartIcons,[™] you can automate common spreadsheet tasks, just by pointing and clicking the mouse. Or create new icons based on your unique needs.

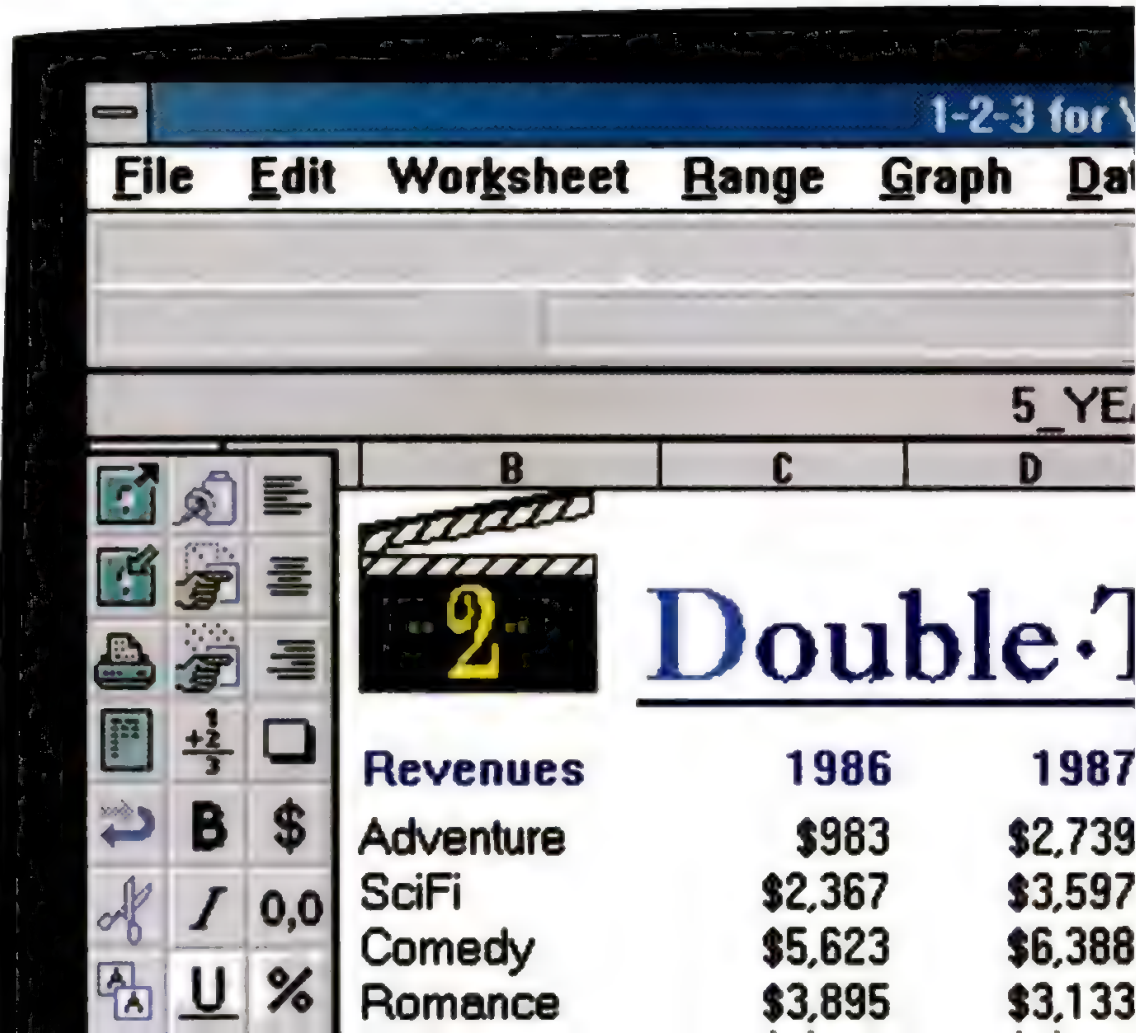
If you're a Windows user, you'll be comfortable with its pull-down menus,

"In 1-2-3 for Windows, Lotus offers a true, no-compromise Windows application as well as outstanding backward compatibility with earlier versions."

—PC COMPUTING, 9/91*

"The new 1-2-3 has some interesting Windows features, especially the 'icon palette' that allows users to build a customized set of point-and-click commands. That feature is so handy that Microsoft and Borland have quickly vowed to match it in future versions of their own spreadsheets."

—THE NEW YORK TIMES, 9/8/91



ndows.



dialog boxes, sizable windows and mouse support. What's more, 1-2-3 for Windows delivers superior spreadsheet publishing capabilities. Along with industry-leading spread-

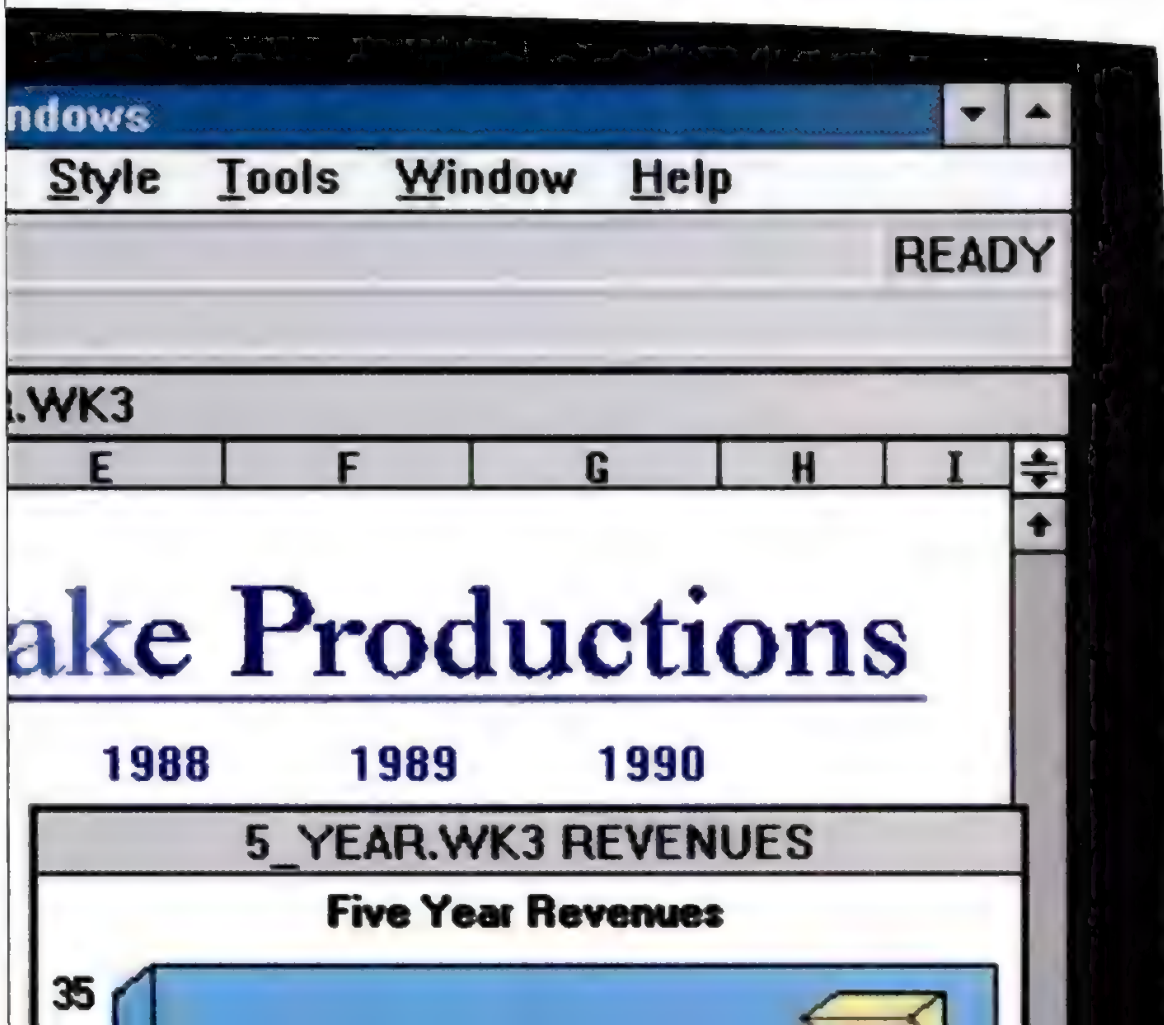
sheet technologies such as 3D worksheets, Solver goal-seeking features and external data access through Datalens.* Better still, if you're a current 1-2-3 user, you'll have instant access to the 1-2-3 Classic* menu merely

by pressing the slash (/) key. Which means any 1-2-3 user will feel right at home from the start.

So see why Lotus® 1-2-3 for Windows is more than a great Windows spreadsheet. It's everything you've been looking for in one.

For a free auto demo or to order your upgrade, call **1-800-872-3387, Ext. 6296.**

Lotus 1-2-3 for Windows



For DOS.

Two terrific spreadsheets for DOS, both distinctly 1-2-3.

Sure, the software world is excited about Windows. But there's also a world of people committed to DOS. And we haven't forgotten them. That's why we've continued to enhance the functionality of our two DOS spreadsheets. Both of which run in a graphical WYSIWYG environment, featuring full mouse support, File Viewer, Auditor and outstanding publishing capabilities.

So, if you want a fast, graphical spreadsheet that runs on today's PCs, then 1-2-3 Release 2.3 is for you. If you're a spreadsheet user who needs technologies like 3D and Solver, then 1-2-3 Release 3.1+ is the way to go. In either case, the DOS world has never had it better. For a free auto demo or to order your upgrade today, call **1-800-872-3387, ext. 6297.**



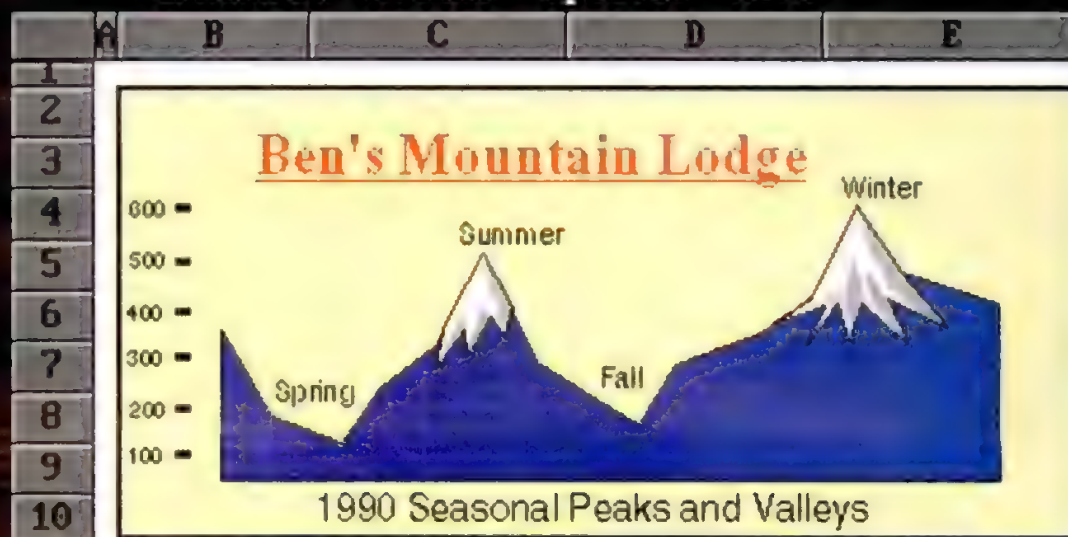
Lotus 1-2-3 for DOS

"With 1-2-3 Release 2.3 Lotus has not only made it possible to work with your spreadsheet while it displays fonts and graphics, but it has made the product very fast at doing so."
—INFO WORLD, 5/13/91

"...latest release of 1-2-3 for DOS, 3.1+, couples utilities from its 1-2-3 siblings with the package's inherently powerful three-dimensional capabilities."
—PC WEEK, 8/5/91

G19: {H16}

Frame Grid Page-Breaks Cell-Pointer Intensity
1-2-3 Enhanced Relief Special None



Revenues by Season:	1989	1990
Spring	\$128,973	\$161,216
Summer	386,942	483,678
Fall	157,438	196,798

For Mac.

The power of 1-2-3. The essence of Macintosh.*

From the time you first click on the 1-2-3 icon, it's clear that this version of 1-2-3 is a full-fledged, no-holds barred Mac® application.

Although we designed it from the ground up for Macintosh, we've still made it completely compatible with all other versions of 1-2-3. Which means you get complete file, format and macro compatibility. And it includes features that are uniquely 1-2-3, such as true 3D technology. Of course, 1-2-3 for Macintosh works with either System 6 or System 7, and everything that comes with it.

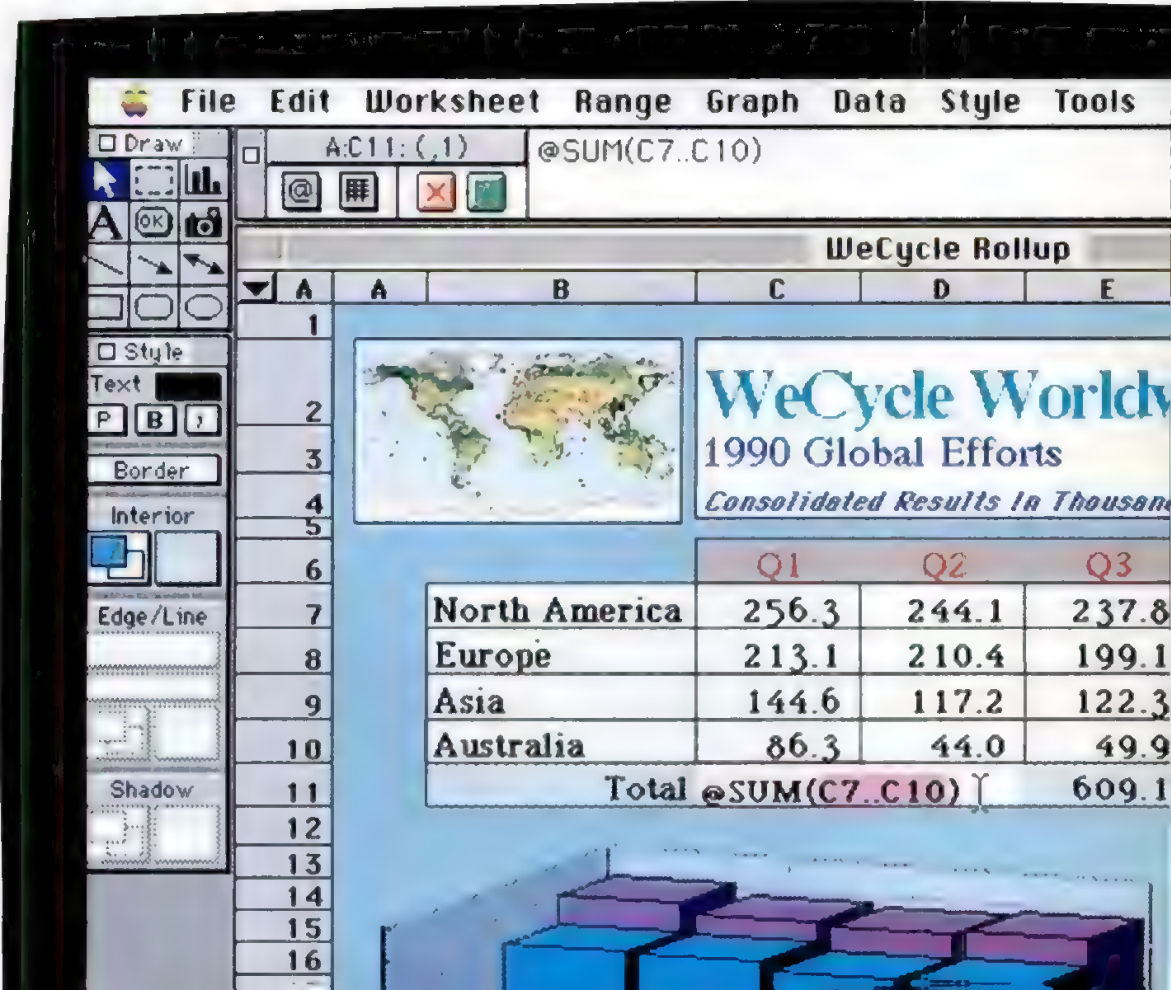
So see what happens when the power of 1-2-3 works together with the essence of Macintosh. Lotus 1-2-3 for Macintosh will be available soon. In the meantime, call **1-800-872-3387, ext. 6298** for a free demo video.



Lotus 1-2-3 for Macintosh

"...a spectacular product!"

—JOHN SCULLEY,
CHAIRMAN AND CEO,
APPLE COMPUTER, INC.



For OS/2.

The 1-2-3 spreadsheet that fully exploits the graphical environment of OS/2.

This is the spreadsheet that takes advantage of the speed, memory and multi-tasking capabilities of OS/2.* It delivers all the power you'd expect from 1-2-3, including true 3D worksheets, file-linking and access to external databases. Without compromising any of the compatibility concerns you may have.

Nor does it sacrifice any of your knowledge of 1-2-3. In fact, you can use either the mouse or the keyboard, whichever you prefer. Lotus 1-2-3 for OS/2 was also the first spreadsheet to introduce the unique Solver technology to help you turn "what-if" problems in your worksheets to "how-to" solutions.

So if you're thinking of moving to the world of OS/2, you needn't worry. We're already there. For more information, call **1-800-872-3387, ext. 6299.**



Lotus 1-2-3 for OS/2

Thanks to its multi-windowing capabilities, 1-2-3 for OS/2 lets you look at your graphs and spreadsheet simultaneously. Whether it's working with a 3D file or bringing in information from external databases the full power of 1-2-3 for OS/2 is always within reach.

The screenshot shows the Lotus 1-2-3 for OS/2 interface. The title bar reads "1-2-3 for OS/2: WORLD.DSK". The menu bar includes "File", "Edit", "Worksheet", "Range", "Copy...", "Move...", "Print", and "Graph". The active worksheet is "WORLD.WG2". The spreadsheet displays a table for "Worldwide Food Corporation" with the following data:

	Qtr 1	Qtr 2	Qtr 3
Facilities	\$19,292	\$26,477	\$19,705
Travel	\$18,567	\$21,345	\$17,767
Entertainment	\$28,125	\$24,220	\$29,654
Recruitment	\$29,270	\$27,621	\$35,500
TOTAL	\$95,254	\$99,663	\$102,626

At the bottom, a "Move" dialog box is open, showing a "From:" field and a vertical axis with values 50000 and 60000.

For UNIX.

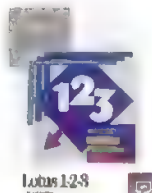
The spreadsheet standard, 1-2-3, optimized for UNIX.

All the features and functionality of Lotus 1-2-3, the world's most popular spreadsheet, are there for you in the world of UNIX.[®] In fact, 1-2-3 is running on UNIX-based workstations from leading hardware vendors. As well as on PCs running either UNIX or XENIX[®] operating systems.

1-2-3 for UNIX offers powerful analytical and presentation capabilities. And it's completely compatible with all versions of 1-2-3. Which means if you're moving to the UNIX environment, your files, macros and knowledge go with you. And of course, our UNIX customer-support team will be there to help you along the way.

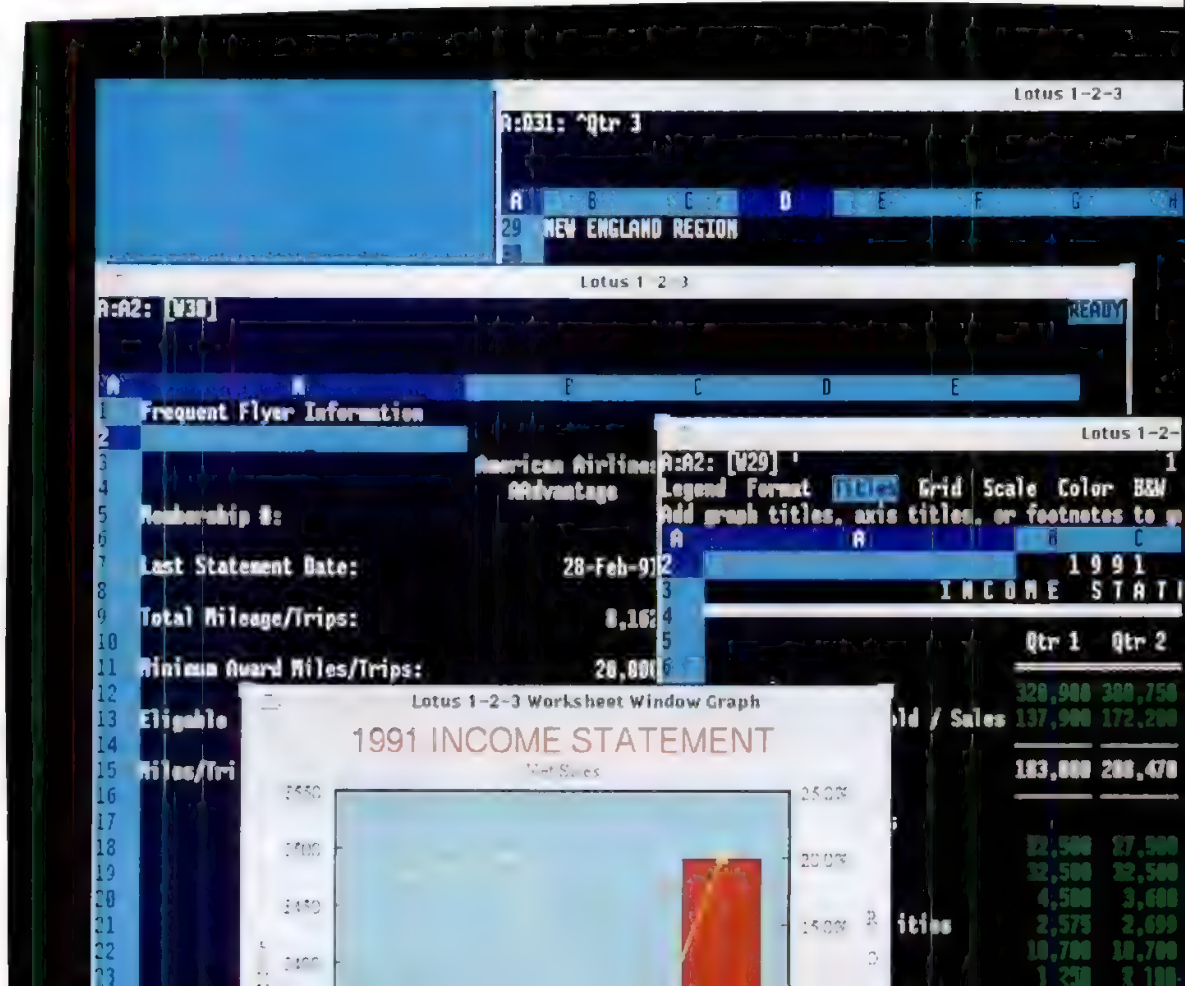
All of which is proof that Lotus means business on UNIX.

For more information on a specific platform or for the name of the Lotus Authorized Reseller nearest you, please call **1-800-343-5414, ext. 6300.**



Lotus 1-2-3 for UNIX

1-2-3 for UNIX lets you take advantage of the 3D technology and advanced file-linking found in other versions of 1-2-3.



For You.

Lotus 1-2-3. The only spreadsheet that works together across all major operating platforms.

You could say that 1-2-3, the language of business for over 14 million people, is available in many different dialects. All of which understand each other. Which means when you use any version of 1-2-3, you can be certain you'll get full compatibility across all platforms. With no hassles whatsoever. And that means working together with complete data integrity and flexible worksheet sharing, regardless of which 1-2-3 you're working with.

Plus, we're committed to enhancing our spreadsheets to exploit their operating environment with innovations that make them more powerful and easy to use.

What's more, each of our 1-2-3 spreadsheets is supported not only by a host of add-in applications, but also by comprehensive Lotus customer service, including 24-hour 7-day a week toll-free service.**

So call us today. Because even though there may be no standards when it comes to operating systems, there is one when it comes to spreadsheets.



Finally, it helps to own a plotter, particularly if you want to output D- and E-size drawings (see glossary), but you can get away with a laser printer if you can live with 8.5- by 11-inch output. Fortunately, many CAD programs offer a Fit command that will size a drawing to fit on whatever page size your hard-copy device supports.

THE REVIEW PROCESS

To put the packages through their paces, we asked each reviewer to duplicate two drawings that we supplied. One was a floor plan (see Figure 1), designed to test each package's adeptness at creating architectural drawings; the other (Figure 2) contained three orthogonal views of a piston rod, designed to test a package's mettle at producing mechanical drawings.

Both drawings were designed to trip up inferior CAD programs. The piston drawing, for example, required the package to fillet between lines and arcs, not just line to line. It also tested the program's ability to draw lines tangent to two circles, its

ability to create dimensions at odd angles, and its capacities for text creation and editing.

We also tested each product's effectiveness in handling file conversions to and from .DXF, an Autodesk-standard format used to move drawings into and out of *AutoCAD*, the leading high-end package. This test is significant because the .DXF format changes with every release of *AutoCAD*, making that format a moving target for developers. Our reviewers first imported a .DXF file, comparing the results against a master, then exported the floor plan and piston drawings in .DXF files, which we evaluated in *AutoCAD*. We considered .DXF support adequate if the tested package could import the .DXF found in *AutoCAD*, Release 10 or later, and could export a .DXF file without losing entities.

CHOOSING A CAD SYSTEM

How do you choose the CAD system that's right for you? To get you started, we

provide Suitability to Task ratings that grade each package on its adeptness at creating architectural and mechanical drawings. If your primary use for a CAD system is creating floor plans, you'll naturally look first at the packages that scored high in the architectural category. If, on the other hand, you spend your days turning out engineering drawings, you'll concentrate on those that scored high in the mechanical category.

If translating files to and from .DXF format is important in your work, a quick scan of our Summary of Features table will reveal your contenders, the packages that have .DXF import and export capabilities. You will need to refer to the reviews, though, to see how well the .DXF support is implemented.

Both *Generic CADD* and *AutoSketch* have found homes at large design firms that want to provide their engineers with tools for reviewing *AutoCAD* drawings without the expense of supplying copies of *AutoCAD* at \$3,500 a pop. If you'll be exchanging data with mainframe CAD systems, then it is probably a good idea to

LOW-COST 2-D CAD PACKAGES: GLOSSARY

■ **attribute** Any text linked to a part of a drawing; often a description of an object.



■ **break** Erase a specified part of a line, circle, arc, or polyline.

■ **chamfer** To bevel a corner or edge with a straight line segment. When used as a noun, it means a beveled edge.



■ **.DXF** Drawing Interchange File. An Autodesk-specified format for exchanging drawing files between *AutoCAD* and other CAD packages.

■ **E-size** One of the standard plotting sizes for architectural and mechanical drawings: 43 by 33 inches.

■ **entity** A simple graphics element—a line segment, arc, circle, or symbol—used as a building block for CAD drawings. Synonymous with *primitive* (below).



■ **fillet** To round a corner with an arc, as opposed to a straight line segment. When used as a noun, it refers to the arc itself.

■ **grid** A framework of regularly spaced dots used to help place graphics elements on-screen accurately; the electronic equivalent of graph paper.

■ **hatch** To fill a defined drawing area with a distinctive line pattern. Used for highlighting, indicating cross sections, identifying materials, or giving depth to a drawing.

■ **pan** Move the part of the drawing currently displayed up, down, right, or left without changing the magnification.



■ **polyline** A single drawing object composed of lines that share vertices.

■ **primitives** Basic graphics elements, such as line segments, curves, and endpoints, which may be combined into more-complicated drawing elements.

■ **rubber-banding** Connecting the cursor to a fixed point by a line or other object that stretches and contracts like a rubber band as the cursor moves. This is basically a previewing tool for object placement.



■ **snap** To jump; a semi-automated method for connecting elements of drawing geometry. The operator specifies "snap to x," where x is a point on some existing entity. The command Snap to Midpoint, for example, results in a new line jumping and attaching itself to the midpoint of the nearest line segment.

■ **symbol** A schematic picture of a frequently used drawing element; for example, a door swing or a window that can be placed as a single unit.

■ **trim** To clean up extraneous parts of overlapping drawing elements automatically after construction.



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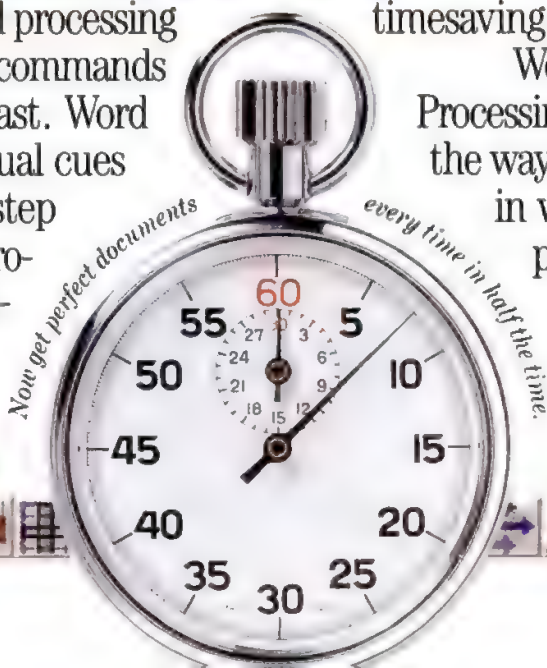


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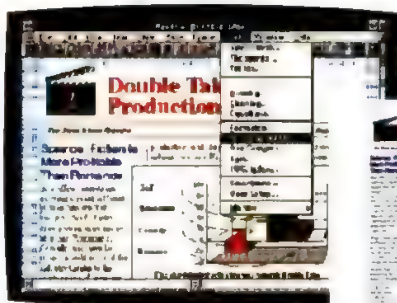


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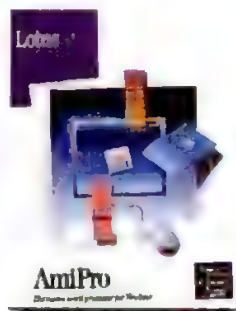
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LOW-COST 2-D CAD PACKAGES: SUITABILITY TO TASK

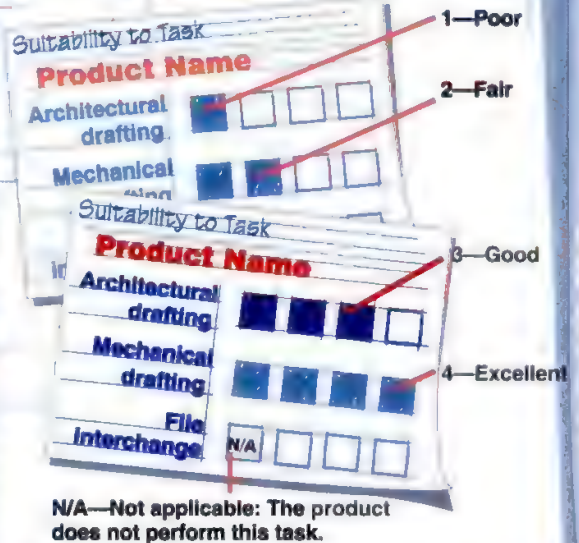
The ten 2-D CAD packages we chose for review are all general drafting packages. Yet, for a number of reasons, individual CAD products are more suited to one type of work than another. We rated the ten programs on the three types of tasks that CAD users will need to consider in judging a product's suitability: architectural drafting, mechanical drafting, and file interchange.

To qualify for a high score in either of the drafting categories, a package had to be powerful and reasonably easy to use. Specifically, it had to possess a generous selection of drawing and dimensioning tools, to be adept at handling text annotations, and to do a good job of printing and plotting.

Architectural drafting Perhaps the single most important feature that distinguishes a good architectural package is that it lets you create, manage, and apply architectural symbols easily. Adeptness at working in feet and inches is crucial to architectural work in North America. Database and reporting capabilities that track equipment and materials and generate bills of materials are a big plus. Finally, specialized construction tools, such as double-line drawing and automated intersection trim, can speed up architectural work significantly.

Mechanical drafting Easy and accurate dimensioning, especially of arcs and circular structures, is particularly important in mechanical drafting, as is tolerancing (the inclusion of tolerance specifications for manufacturing). Since mechanical drawings often include enlarged detail inserts, automatic extraction of details from a master drawing is essential to a mechanical CAD package. Easy and flexible filleting and chamfering (see the glossary) are important in mechanical work. Finally, a good mechanical drafting package must be able to apply cross-hatching and pattern fills to indicate cross sections and identify materials easily.

File interchange For many users of low-cost CAD packages, the ability to import files from and export files to industry-leading *AutoCAD* is important, if not vital. By and large, exporting to *AutoCAD* via the .DXF format was not a problem for the packages we reviewed. Importing was a different story. Among the problems we experienced were improperly rendered drawing geometry or other elements, failure to import dimensioning, and faulty, inaccurate, or misapplied dimensioning. To receive a rating of excellent, a package had to import the .DXF file with all the drawing geometry and dimensioning intact, and export the floor plan and piston drawings to an *AutoCAD*-compatible file.



Note: The sum of the scores should not be used for product comparison and is not a factor in determining Editors' Choices.

select a package that supports the IGES standard for neutral-format input and output.

You should use the reviews in combination with the features table to match CAD packages to your needs. For example, if a package does not support the use of symbols, or if its symbol-handling capability is limited or awkwardly implemented, the package is a poor choice for anyone whose primary business is creating floor-plan layouts or electrical schematics.

However you plan to use your CAD system, don't lose sight of the almost inevitable trade-off between features and ease of use. If your CAD software will serve primarily as a sketching tool, you should probably avoid the more sophisticated packages; their learning curves tend to be steep. Chances are you would be better served by a less powerful package that sacrifices features for ease in learning. One package that fills the bill particularly well is *AutoSketch*. It's terrific for

creating quick sketches and conveying design ideas, and its user interface is so well crafted that you can be using it productively within minutes of removing the wrapper.

But if you will be using your CAD software for industrial-strength drafting and design, don't shortchange yourself. If you opt for a less sophisticated package to avoid the up-front training ordeal, you may pay dearly in terms of lost capability later on. Fortunately, power and ease of use are not always mutually exclusive. Some of the packages we reviewed, notably *Generic CADD* and *FastCAD*, are as easy to learn and use as they are rich in features.

Many low-end CAD buyers are shopping for a package that they can use to review drawings constructed in *AutoCAD* or other high-end software packages. If this is your aim, pay attention to the quality of a package's .DXF import and export.

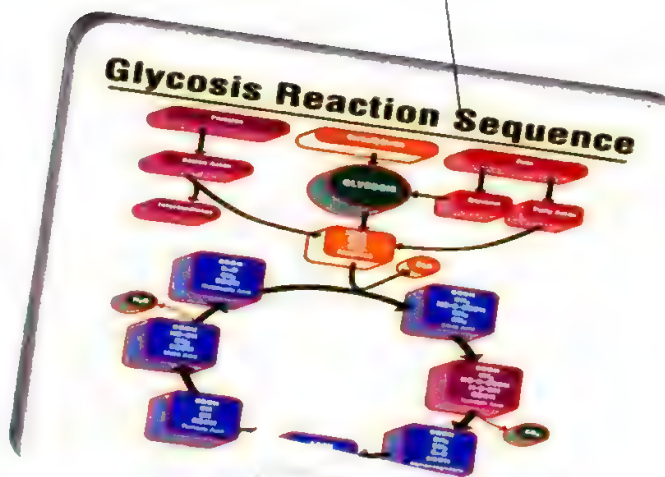
While *Generic CADD*'s .DXF import

and export routines performed flawlessly on our tests, most of the packages experienced at least one difficulty. Export problems you can expect to see range from incorrect translation of entities to simply exporting a file that *AutoCAD* can't understand. Dimensioning tends to pose the biggest import problem: A package will usually misplace the dimensions, in some cases rendering them unusable. For instance, while *AutoSketch*—brought to you by the *AutoCAD* people themselves—performed well when exporting to the .DXF format, it lost all dimensions during import.

Will CAD improve your productivity in drafting-related work? Those users who have made the transition think so, as evidenced by the explosive growth in the CAD market in recent years. Whatever your uses for CAD might be—unless they fall at the extreme high end of the spectrum—you should find a product that can help you get the job done in the pages that follow.

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GRAPHICS

LOW-COST 2-D CAD

AutoSketch

by Jim Boyce and Jeff Prosis

Autodesk's *AutoCAD* has long been the leader in high-end PC-based CAD. While its little brother certainly does not have the same range of features as its sibling, *AutoSketch*'s \$249 price tag, well-rounded features set, and resemblance to *AutoCAD* make it a product worth considering if you are looking for a good all-around drawing and sketching tool. Unfortunately, *AutoSketch* lacks its big brother's skill at serious drafting.

AutoSketch's interface is well conceived and easy to learn. You access its commands through pull-down menus or the function keys; when it needs additional information about a command, *AutoSketch* pops up a dialog box, much like *AutoCAD* does. The programs also share many of the same commands, so if you already know how to use *AutoCAD*, you will be up and running in no time at all.

AutoSketch actually outshines its elder sibling in some areas. For example, it is particularly adept at handling text. In addition to a Quick Text command for

entering text directly into a drawing, you can invoke a text editor included in the program. After you select a point to locate the text, *AutoSketch* opens a text editor window, which comes complete with insert and overtype modes, ASCII import and export features, cut-and-paste commands, and a Settings button that lets you set font characteristics. You can enter the text in the editor, or import text from an external document. To edit text, you simply point at it and *AutoSketch* pops up the text editor again, this time with the specified text loaded and ready for editing. These capabilities made adding notes to PC Magazine Labs' test drawing a breeze.

The program's handling of file libraries is another area in which *AutoSketch* excels. Selecting the File Open or Part command (the latter is the command used to import a symbol) brings up a dialog box that displays icons of the available *AutoSketch* drawings. You can locate a drawing visually rather than by name, but for help in differentiating between similar drawings, the name of the file appears below the icon. *AutoSketch* rereads the

FACT FILE

AutoSketch
Autodesk Inc., 2320
Marinship Way,
Sausalito, CA
94965; 800-223-
2521, 415-332-
2344.
List Price: \$249.
Requires: 286-based PC or better, 512K RAM
(640K RAM recommended), hard disk, CGA
graphics adapter or better, DOS 2.0 or later.
EMS. Math coprocessor recommended.
In Short: *AutoSketch*'s similarities to its big
brother *AutoCAD*, a full set of drawing
commands, and exceptional text handling
make it a package worth considering for
drawing and sketching. Problems with
dimensioning, hatching, and filling make
AutoSketch hard to recommend for serious
drafting work.



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drawing files each time the File Open dialog box is displayed, so you do not have to create a separate icon file each time you add a new drawing or revise an existing one.

AutoSketch features a full set of drawing commands, including the usual options for creating lines, circles, arcs, polylines, ellipses, and curves. There are no surprises here, just a solid set of drawing commands that work the way you would expect. The usual commands for editing geometry are here, too, including commands for filleting, chamfering,

Suitability to Task

Task	AutoSketch
Architectural drafting	☒ ☒ ☐ ☐
Mechanical drafting	☒ ☒ ☐ ☐
File Interchange	☒ ☒ ☒ ☒

stretching, moving, copying, scaling, and erasing, as well as the ability to group entities into multiple unnamed groups for easy editing.

While *AutoSketch* does not include construction entities (a feature that is also missing from many high-end programs), it does include a complement of tools for locating drawing geometry precisely. Its fully variable snap and grid options allow you to rough out a design quickly, and its wide range of attach modes (which substitute for snaps) let you lock onto intersections, endpoints, and centers.



EDITORS' CHOICE

- *DesignCAD 2-D*
- *Generic CADD*

Two products share the Editors' Choice award for 2-D CAD. On PC Magazine Labs' tests, both *DesignCAD 2-D*, from American Small Business Computers, and *Generic CADD*, from Autodesk Retail Products, excelled in handling our suite of architectural and mechanical drafting tasks. And each costs less than \$500—half the \$1,000 price we used as a cutoff point for inclusion in this review.

While both packages are top-notch performers, long on features and virtually guaranteed to satisfy the buyer, each is endowed with special strengths that set it apart. *DesignCAD*'s command interface, for example, can be customized extensively. Users can reorganize menus, delete unused commands, and even create new commands using the built-in macro and programming languages. The package's support for a myriad of

input and output devices makes it a viable tool in just about any hardware environment, and its \$349 price tag makes it a bargain.

Generic CADD is fast; it came in third—behind *Evolution Computing*'s speedy *EasyCAD 2* and *FastCAD*—in our tests with a math coprocessor. It is also remarkably easy to learn for such a powerful package. A nested command structure makes *Generic CADD* a particularly nimble worker, and its .DXF file import and export capabilities are second to none, although they do require a separate \$99 module.

EasyCAD 2 and *FastCAD* deserve honorable mentions, along with *Foresight Resources Corp.*'s *Drafix CAD Ultra/386*. These are all good packages—very good, in fact—but they do not quite measure up to the sophistication and elegance of *DesignCAD 2-D* or *Generic CADD*.

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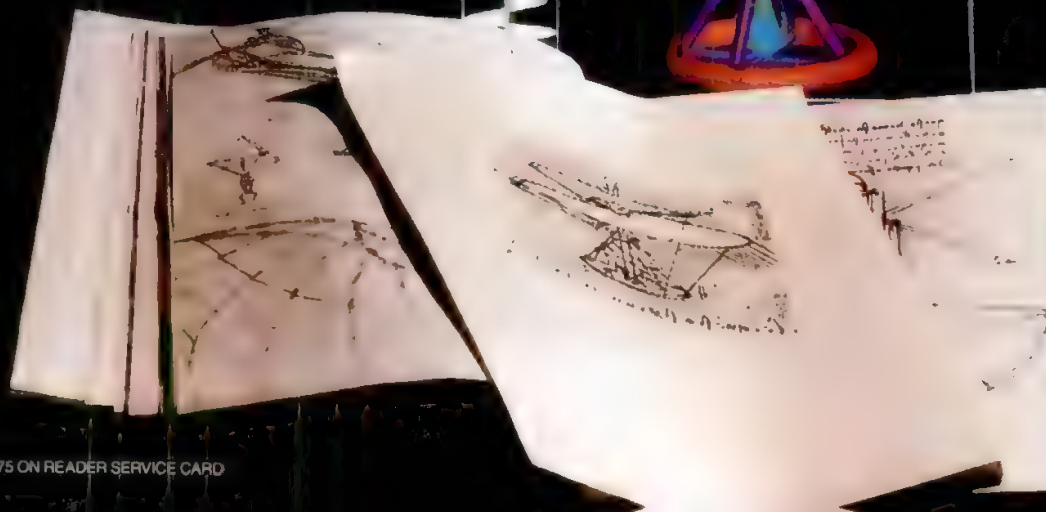
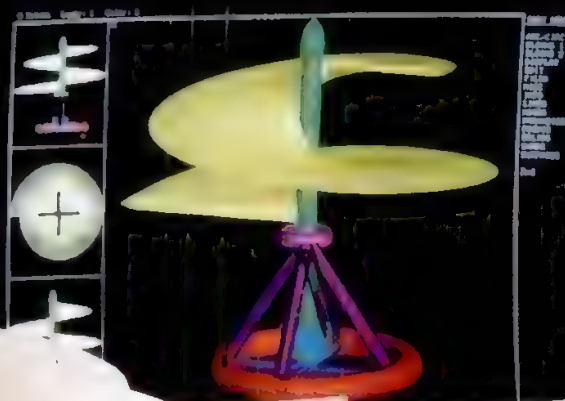
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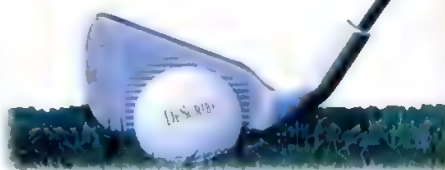


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GRAPHICS

LOW-COST 2-D CAD

A DIMENSIONING DUD

The most disappointing aspect of *AutoSketch* is its deficient set of dimensioning commands, which make the program unsuitable for serious drafting work. While *AutoSketch* includes commands for adding linear and angular dimensions, it lacks commands for creating radial and diametral dimensions and leaders. It does not support chain or baseline dimensioning and will not place tolerances on dimension text. In order to finish the PC Labs mechanical drafting test, we had to take the time to create these annotations by hand, which was a slow and time-consuming process. The program does include commands for measuring angles, areas, distances, and bearings, and to its credit, the dimensions you place in a drawing are associative.

The software's hatching and filling commands are also somewhat annoying. Rather than allowing you to designate existing entities to serve as a boundary for its Pattern Fill command, *AutoSketch* requires that you select points along the boundary. That's fine if the boundary contains only lines, but if it contains splines or arcs, the work is tedious. Users would be better served by an *AutoCAD*-like hatch command that uses entities already on the screen.

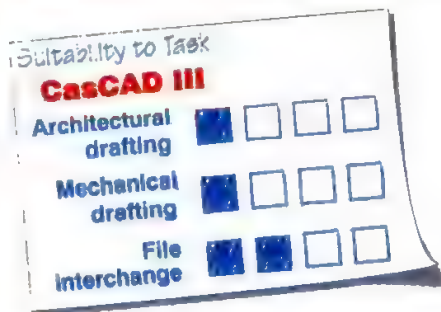
AutoSketch has good .DXF import/export capabilities. It tends to lose the dimensions of imported files, but its export capability is excellent. If you are looking for a low-cost CAD program to serve as a sketching and drawing tool or a stepping stone to the more expensive and powerful *AutoCAD* program, *AutoSketch* has much to recommend it. If you are looking for a heavy-duty drafting package, then you will be better served by some of the more full-featured CAD programs on the market.

CasCAD III, Version 1.03

by Rod Taylor

In the contest to capture the low-end 2-D CAD product market, *CasCAD III* weighs in as a lightweight. You get quite a bit for \$350 (the CAD program, database export capability, and .DXF file exchange tools), but the interface is so awkward and the program so buggy that it hardly qualifies as a bargain.

By far the most notable and unusual feature of *CasCAD III* is its ability to run on a dual-monitor setup. Configured this way, the program drives one monitor in monochrome 80-by-25 text mode and the other in high-resolution graphics mode. The text monitor displays menu commands, while the graphics monitor displays the drawing. You can, of course, run the program under a single-monitor setup, toggling between the two displays. This



mode of operation, however, makes learning to use *CasCAD III* difficult.

Installing *CasCAD III* is as simple as following the screen prompts that advise you when to insert the various disks. (It does not inform you when you are done, however.) Be aware that the program will not let you specify a directory to install to; it insists on the directory Cascade. The installation program does not offer you the option of handling the necessary modifications to your AUTOEXEC.BAT or CONFIG.SYS files. You will have to adjust the configuration yourself the first time you run *CasCAD III*.

The program supports several types of input devices, including the Microsoft serial mouse and the Summagraphics Summasketch Pad, as well as six video card drivers for single-monitor systems and nine drivers for dual-monitor systems. The video drivers can be problematic, however: Although the monitor and Tseng-based video card we used support Super VGA graphics, *CasCAD III* locked up when we attempted to run it in 640-by-480 VGA mode. It did, however, run in 640-by-350 EGA mode.

MANGLED MANUAL

CasCAD III comes with an Operator's Manual, the *CasCAD* template for use with digitizing tablets, and four sample drawings that illustrate the dimensioning, detailing, and curve-generating capabilities of the package. The manual, however,

suffers from a variety of problems; the most obvious is that 28 of its 65 screenshots are blank. Moreover, the menu screenshots in the manual do not correspond to the on-screen menus. For example, the manual lists an Area Fill option under the QuickDraw menu that does not exist in the program.

Ten of the 32 main menu commands listed in the table of contents are not implemented in the program, and two have been relocated to auxiliary menu status. The tablet overlay even reproduces one of these nonimplemented main menu commands, Construction Tools. This adds up to a frustrating if not totally confusing introduction to *CasCAD III*. To make matters worse, there is no tutorial, so you will have to decipher the awkward interface on your own. The pleasant technical support people at Cascade Graphics Systems can be a big help in this regard.

Having separate screens for menus and graphics display offers a distinct advantage over more traditional CAD system environments. The menus are expanded since they are not limited to a small area at the edge of the screen; therefore, it is easy to navigate using your digitizer or with two-digit keystroke commands. Unfortunately, these menu structures suffer from a somewhat haphazard layout: It can be quite difficult to determine which options are associated with a given menu command. Also, 8 of the 28 commands shown on the main menu screen are inoperative. And it is impossible to tell whether a highlighted menu item is active or simply located underneath the text cursor.

Those with fast computers may experience difficulty in getting *CasCAD III* up

FACT FILE

CasCAD III, Version 1.03
 Cascade Graphics Systems, 18001 Cowan, Suites C and D, Irvine, CA 92714; 800-523-7188, 714-757-2972.
List Price: \$350.
Requires: 512K RAM; hard disk: 1.2MB 5.25-inch floppy disk drive; CGA graphics adapter or better; DOS 2.0 or later; mouse, digitizing tablet, joystick, or Koala pad. Extra screen, math coprocessor optional.
In Short: Limited video support, poor documentation, and a weak user interface undermine this program's robust collection of drafting commands and better-than-average .DXF file translation. Despite the low price, *CasCAD III* is tough to recommend.

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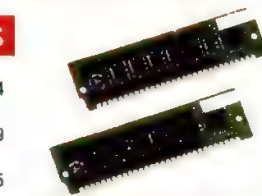
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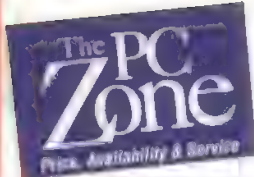
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Walt Disney Software

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Zondervan Electronic Pub

NIV PC Bible Study	99
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Broderbund Software Where in America's Past is Carmen Sandiego?

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Windows. 35 fantastic displays include sound. You can customize with your company logo or graphics, type in messages or set up slide show style presentations. Provides screen-locking protection. Supports monochrome and color.



MULTIMEDIA & MUSIC

Activision

The Music Studio 3.0	58
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Ad Lib

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Autodesk, Inc.

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I.B.M.

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ibis

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ibis

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GRAPHICS

LOW-COST 2-D CAD



LOW-COST 2-D CAD PACKAGES: SUMMARY OF FEATURES

Products listed in alphabetical order

	AutoSketch	CasCAD III	DesignCAD 2-D	Drafix CAD Ultra/386	Drafix Windows CAD	Draft Choice	EasyCAD 2
List price	\$249	\$350	\$349	\$395	\$695	\$55	\$199
GENERAL INFORMATION							
Environment	DOS	DOS	DOS	DOS	Windows	DOS	DOS
Interface options:							
Commands	■	■	■	■	■	■	■
Function keys	■	■	■	■	■	■	■
Side screen menus	■	■	■	■	■	■	■
Pull-down menus	■	■	■	■	■	■	■
Pop-up menus	■	■	■	■	■	■	■
Icon menus	■	■	■	■	■	■	■
Memory support:							
DOS applications:							
Expanded (EMS)	■	■	■	■	N/A	■	■
Extended (XMS or protected mode)	■	■	■	■	N/A	■	■
Virtual (overflow to disk)	■	■	■	■	N/A	■	■
Windows applications:							
Standard mode (3.0)	N/A	N/A	N/A	N/A	■	N/A	N/A
386 Enhanced mode (3.0)	N/A	N/A	N/A	N/A	■	N/A	N/A
Networking:							
Network support	■	■	■	■	■ (via Windows)	■	■
NetBIOS	■	■	■	■	■	■	■
NetWare	■	■	■	■	■	■	■
LAN Manager	■	■	■	■	■	■	■
Runs from server	■	■	■	■	■	■	■
Supports file locking	■	■	■	■	■	■	■
Shares network printers or plotters	■	■	■	■	■	■	■
Input devices supported:							
Digitizing tablet	■	■	■	■	■	■	■
Mouse	■	■	■	■	■	■	■
Supports math coprocessor (Intel or compatible)	■	■	■	■	■	■	■
DRAFTING							
Entities:							
Arc:							
3-point	■	■	■	■	■	■	■
Center plus 2 points	■	■	■	■	■	■	■
Center plus angle	■	■	■	■	■	■	■
Circle:							
Center/radius	■	■	■	■	■	■	■
Center/diameter	■	■	■	■	■	■	■
3-point	■	■	■	■	■	■	■
Curve:							
Multipoint curves	■	■	■	■	■	■	■
Spline curves	■	■	■	■	■	■	■
Bézier curves	■	■	■	■	■	■	■
Edit nodes and control points	■	■	■	■	■	■	■
Ellipse	■	■	■	■	■	■	■
Line	■	■	■	■	■	■	■
Polygon	■	■	■	■	■	■	■
Polyline	■	■	■	■	■	■	■
Automatic polygon closing	■	■	■	■	■	■	■
Rectangle	■	■	■	■	■	■	■
Drafting options:							
Draw on-screen	■	■	■	■	■	■	■
Draw using commands	■	■	■	■	■	■	■
Freehand sketching	■	■	■	■	■	■	■
Specify exact measurements when drawing	■	■	■	■	■	■	■

■—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

GRAPHICS
LOW-COST 2-D CAD

CONTINUES

Another limitation of *CasCAD III* is its inability to zoom out beyond the extents of the drawing sheet. Any geometry located outside of these extents may be viewed only by panning. This made it difficult to determine whether any spurious off-screen geometry was read into *CasCAD III* during the .DXF import test, since such geometry is outside the workspace boundary of the drawing.

CasCAD III's dual-monitor setup, robust collection of drafting commands,

DesignCAD 2-D is easy to install, thanks to the well-written installation and tutorial manual. The basic program requires about 2.2MB of hard disk space, while the sample drawings and more than 500 symbols occupy another 1.2MB, so beware if you are installing *DesignCAD*

DECEMBER 17, 1991 PC MAGAZINE 245

You've probably seen recent press articles on "repetitive motion" injuries suffered by computer users. The problem is significant. Workstation design and worker rest periods have already been regulated in San Francisco; federal guidelines will follow.

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We make computer mice, and more of them than any other company.

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Are PC Users Working Th



motion injuries.⁽¹⁾

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and ergonomics researchers, and consumer testers, we've developed mice that are more

1 Based on research by World Health Org., US Dept. of Health and Human Services, Logitech, and others; included in backgrounder referenced above.

Put Your Fingers To The Bone?



comfortable in more types of hands (left and right) than any other brand. And their

shape, weight, sensitivity and three-button programmability minimize user effort.⁽¹⁾

Available for IBM® compatible personal computers, Macs®, and Sun™ workstations, each mouse carries a lifetime warranty and software compatibility guarantee. Try them where you see our hands-on dealer display. Corporate buyers might also want to read our detailed backgrounder on the subject — *Computing Ergonomics*. For a copy, or the location of your local dealer, call 800 231-7717 ext. 310.



Tools That Power The Desktop.

GRAPHICS

LOW-COST 2-D CAD

LOW-COST 2-D CAD PACKAGES: SUMMARY OF FEATURES

Products listed in alphabetical order

	AutoSketch	CasCAD III	DesignCAD 2-D	Drafix CAD Ultra/386	Drafix Windows CAD	Draft Choice	EasyCAD 2
DRAFTING COMMANDS							
Snaps:							
Grid	☒	☒	☒	☒	☒	☒	☒
Ruler	☒	☒	☒	☒	☒	☒	☒
Nearest point	☒	☒	☒	☒	☒	☒	☒
Endpoint	☒	☒	☒	☒	☒	☒	☒
Midpoint	☒	☒	☒	☒	☒	☒	☒
Center of circle	☒	☒	☒	☒	☒	☒	☒
Circle quadrant	☒	☒	☒	☒	☒	☒	☒
Tangent point	☒	☒	☒	☒	☒	☒	☒
Intersection point	☒	☒	☒	☒	☒	☒	☒
Perpendicular	☒	☒	☒	☒	☒	☒	☒
One-time override of snap setting	☐	☐	☐	☒	☒	☐	☒
Trims:							
Trim past intersection	☐	☒	☒	☒	☒	☒	☒
Break	☒	☒	☒	☒	☒	☒	☒
Join endpoints	☒	☒	☒	☒	☒	☒	☒
Extend line	☐	☒	☒	☒	☒	☒	☒
Chamfer	☒	☒	☒	☒	☒	☒	☒
Fillet	☒	☒	☒	☒	☒	☒	☒
EDITING COMMANDS							
Selection:							
By entity	☒	☒	☒	☒	☒	☒	☒
By group of entities	☒	☒	☒	☒	☒	☒	☒
Last entity	☐	☒	☒	☒	☒	☒	☒
By window (marquee box)	☒	☒	☒	☒	☒	☒	☒
By entity type	☐	☒	☒	☒	☒	☒	☒
By layer	☒	☒	☒	☒	☒	☒	☒
Transformations:							
Cut/copy/paste	☒	☒	☒	☒	☒	☒	☒
Duplicate	☒	☒	☒	☒	☒	☒	☒
Flip	☒	☒	☒	☒	☒	☒	☒
Mirror	☒	☒	☒	☒	☒	☒	☒
Rotate	☒	☒	☒	☒	☒	☒	☒
Scale	☒	☒	☒	☒	☒	☒	☒
Arrays:							
Polar	☒	☒	☒	☒	☒	☒	☒
Rectangular	☒	☒	☒	☐	☒	☒	☒
Object controls:							
Lock and unlock	☐	☒	☐	☒	☒	☒	☒
Set visible or invisible	☒	☒	☐	☒	☒	☒	☒
Group or ungroup	☒	☒	☒	☒	☒	☒	☒
Move with rubber-banding	☒	☒	☒	☐	☒	☒	☒
Undo	☒	☒	☒	☒	☒	☒	☒
Maximum number of steps	Determined by hard disk	1	Unlimited	100	16	1	1
DISPLAY AND WORKSPACE CONTROLS							
Redraw, pan, and zoom:							
Manual redraw	☒	☒	☒	☒	☒	☒	☒
Interruptible redraw	☒	☒	☒	☒	☒	☒	☒
Pan	☒	☒	☒	☒	☒	☒	☒
Scroll	☒	☒	☐	☒	☒	☒	☐
Zoom	☒	☒	☒	☒	☒	☒	☒
Fixed increments	☐	☒	☐	☒	☒	☒	☒
By window	☒	☒	☒	☒	☒	☒	☒
By magnification factor	☒	☒	☒	☒	☒	☒	☒
All or to extents	☒	☒	☒	☒	☒	☒	☒

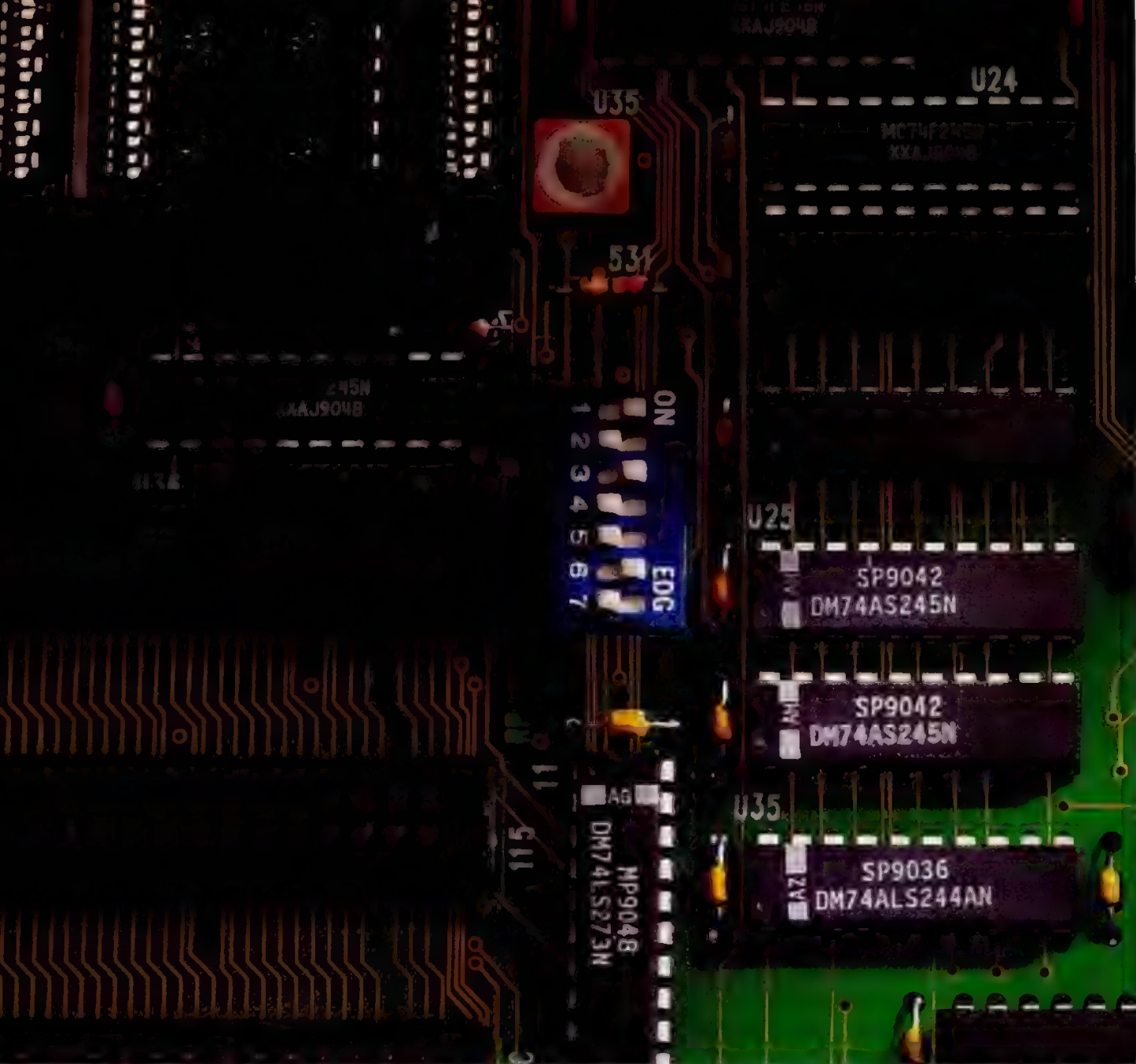
 —Editors' Choice

☒ —Yes

☐ —No

CONTINUES

DECEMBER 17, 1991 PC MAGAZINE 249



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GRAPHICS
LOW-COST 2-D CAD

LOW-COST 2-D CAD PACKAGES: SUMMARY OF FEATURES

Products listed in alphabetical order

	AutoSketch	CasCAD III	DesignCAD 2-D	Drafix CAD Ultra/386	Drafix Windows CAD	Draft Choice	EasyCAD 2
DISPLAY AND WORKSPACE CONTROLS (continued)							
Layers:							
Maximum number of layers	10	256	63	256	256	8	256
Determine layer color	☐	☐	☐	☐	☐	☐	☐
Name layers	☐	☐	☐	☐	☐	☐	☐
Move objects between layers	☐	☐	☐	☐	☐	☐	☐
Displays:							
Cursor coordinates	☐	☐	☐	☐	☐	☐	☐
Current function or snap	☐	☐	☐	☐	☐	☐	☐
Next action prompt	☐	☐	☐	☐	☐	☐	☐
File management:							
Long drawing names	☐	☐	☐	☐	☐	☐	☐
Drawing libraries	☐	☐	☐	☐	☐	☐	☐
Visual drawing catalog	☐	☐	☐	☐	☐	☐	☐
ANNOTATIONS							
Lines:							
Line types	10	10	9	8	9	6	8
Line widths:							
Number of predefined widths	None	1	None	1	5	4	None
Variable widths	☐	☐	☐	☐	☐	☐	☐
Number of predefined line end styles	None	1	5	1	22	2	None
Arrowheads	☐	☐	☐	☐	☐	☐	☐
User-defined arrowheads	☐	☐	☐	☐	☐	☐	☐
Hatch patterns:							
Number of defined hatch patterns	54	10	43	15	15	5	64
Number of defined bitmap patterns	None	None	None	None	None	15	64
User-defined hatch patterns:							
Create	☐	☐	☐	☐	☐	☐	☐
Import	☐	☐	☐	☐	☐	☐	☐
Hatch around islands	☐	☐	☐	☐	☐	☐	☐
Colors:							
Select colors by name or number	☐	☐	☐	☐	☐	☐	☐
Pick colors from palette box	☐	☐	☐	☐	☐	☐	☐
Maximum colors per drawing	128	16	16	16	64	8	16
Text annotation:							
Place lines of text	☐	☐	☐	☐	☐	☐	☐
Word-wrap text	☐	☐	☐	☐	☐	☐	☐
Justify text	☐	☐	☐	☐	☐	☐	☐
Rotate text	☐	☐	☐	☐	☐	☐	☐
Run text along path or arc	☐	☐	☐	☐	☐	☐	☐
Edit existing text	☐	☐	☐	☐	☐	☐	☐
Number of fonts	6	8	20	19	19	2	5
DIMENSIONING							
Associative dimensioning Orientations:							
Horizontal	☐	☐	☐	☐	☐	☐	☐
Vertical	☐	☐	☐	☐	☐	☐	☐
Angled	☐	☐	☐	☐	☐	☐	☐
Diameter	☐	☐	☐	☐	☐	☐	☐
Radius	☐	☐	☐	☐	☐	☐	☐
Styles:							
Baseline (stacked)	☐	☐	☐	☐	☐	☐	☐
Chained	☐	☐	☐	☐	☐	☐	☐
Options:							
Rotated text	☐	☐	☐	☐	☐	☐	☐
Extension lines	☐	☐	☐	☐	☐	☐	☐

 —Editors' Choice

☒ —Yes

☐ —No



COLOSSEUM GeoWorks Ensemble's Elegant Simplicity Challenges Windows On the Home Front	WARRIORS Math Coprocessor Facts and Fantasies: PC Labs Tells The Real Story
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GRAPHICS LOW-COST 2-D CAD

LOW-COST 2-D CAD PACKAGES: SUMMARY OF FEATURES

Products listed in alphabetical order

	AutoSketch	CasCAD III	DesignCAD 2-D	Drafix CAD Ultra/386	Drafix Windows CAD	Draft Choice	EasyCAD 2
DIMENSIONING (continued)							
Tolerances	■	■	■	■	■	■	■
Leaders	■	■	■	■	■	■	■
MEASUREMENTS AND COORDINATES							
Coordinate types:							
Absolute	■	■	■	■	■	■	■
Relative	■	■	■	■	■	■	■
Coordinate systems:							
Rectangular	■	■	■	■	■	■	■
Polar	■	■	■	■	■	■	■
Grid options:							
Set dimensions	■	■	■	■	■	■	■
Set horizontal and vertical increments separately	■	■	■	■	■	■	■
Maximum grid dimensions	Unlimited	33 x 42 inches	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Measurement units:							
Inches	■	■	■	■	■	■	■
Feet and inches	■	■	■	■	■	■	■
Metric	■	■	■	■	■	■	■
Measure:							
Angle	■	■	■	■	■	■	■
Area	■	■	■	■	■	■	■
Distance	■	■	■	■	■	■	■
Perimeter	■	■	■	■	■	■	■
SYMBOLS							
Predefined libraries available:							
Architectural	■	■	■	■	■	■	■
Electrical	■	■	■	■	■	■	■
Other	■	■	■	■	■	■	■
	Electronics, landscaping, residential	Mechanical, mining, tile and grid	Electronics, piping	Landscaping, mechanical, network design	Landscaping, mechanical, network design	Electronics, landscape, mechanical	Electronics, industrial, landscaping
Symbol usage:							
Named	■	■	■	■	■	■	■
Pick from menu	■	■	■	■	■	■	■
Pick from visual representation	■	■	■	■	■	■	■
Scale on insertion	■	■	■	■	■	■	■
Rotate on insertion	■	■	■	■	■	■	■
User-defined symbols:							
Save named groups	■	■	■	■	■	■	■
Add to current library	■	■	■	■	■	■	■
Create libraries	■	■	■	■	■	■	■
Assign attributes to symbols	■	■	■	■	■	■	■
CUSTOMIZATION							
Programmable screen menus	■	■	■	■	■	■	■
Programmable tablet menus	■	■	■	■	■	■	■
Keystroke macros	■	■	■	■	■	■	■
Interpreted command scripts	■	■	■	■	■	■	■
Compiled command scripts	■	■	■	■	■	■	■
Can link external program routines	■	■	■	■	■	■	■
Data files (import/export):							
ASCII text	■/■	■/■	■/■	■/■	■/■	■/■	■/■
.DBF (dBASE)	■/■	■/■	■/■	■/■	■/■	■/■	■/■
.WK1 (Lotus worksheet)	■/■	■/■	■/■	■/■	■/■	■/■	■/■

PC —Editors' Choice

■—Yes

□—No

CONTINUES

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GRAPHICS
LOW-COST 2-D CAD

LOW-COST 2-D CAD PACKAGES: SUMMARY OF FEATURES

	PC						
	AutoSketch	CasCAD III	DesignCAD 2-D	Drafix CAD Ultra/386	Drafix Windows CAD	Draft Choice	EasyCAD 2
CUSTOMIZATION (continued)							
Drawing interchange (import/export):							
.DXF	■/■	■/■	■/■	■/■	■/■	■/■	■/■
IGES	□/□	□/□	■/□	Optional (\$195.00)	■/□	□/□	□/□
OUTPUT OPTIONS							
Printers supported:							
Epson 9-pin	■	■	■	■	■	■	■
Epson 24-pin	■	■	■	■	■	■	■
Hewlett-Packard DeskJet	□	□	■	■	■	■	■
Hewlett-Packard LaserJet	■	□	■	■	■	■	■
Hewlett-Packard PaintJet	■	□	■	■	■	□	■
IBM Proprinter	■	■	■	■	■	□	■
PostScript	■	□	■	□	■	□	■
Color PostScript	□	□	■	□	■	□	■
Printing options:							
Scale to page	■	□	■	■	■	■	■
Select numeric scale	■	□	■	■	■	■	■
Print to file	■	■	■	■	■	■	■
Print multiple copies	□	■	■	■	■	□	■
Spooling (background printing)	□	□	■	□	■	□	■
Draft mode (low resolution)	□	□	■	■	■	■	■
Plotters supported:							
Hewlett-Packard 7550A	■	□	■	■	■	■	■
Houston Instruments	■	■	■	■	■	□	■
Ioline	■	□	■	■	■	□	■
Plotting options:							
Variable sizing	■	■	■	■	■	■	■
Variable dimensioning	■	■	■	■	■	■	■
Automatic scaling	■	■	■	■	■	■	■
Partial plots:							
Selected window	■	■	■	■	□	■	■
Selected layers	■	■	■	■	□	■	■
By attributes	□	■	□	■	□	□	□
Spooling (background plotting)	□	□	■	□	■	□	□
Plot to screen (print preview)	■	■	□	□	■	■	□
Plot to file	■	■	■	■	■	■	■
Multiple copies	□	□	■	■	■	□	□
SCREEN DISPLAY							
Screen drivers:							
Hercules	■	■	■	■	■	■	■
EGA	■	■	■	■	■	■	■
VGA	■	■	■	■	■	■	■
Super VGA:							
ATI	□	■	■	■	■	■	■
Orchid	□	□	■	■	■	■	■
Paradise	□	■	■	■	■	■	■
Tseng 4000	□	□	■	■	■	■	■
Video Seven	□	□	■	■	■	■	■
IBM 8514/A	■	■	■	□	■	□	■
Other high-resolution modes	□	■	□	■	■	■	■
TIGA	□	□	■	□	■	□	□
DOCUMENTATION							
Tutorial manual	■	□	■	■	■	■	■
Sample files	■	■	■	■	■	■	■
On-line help	□	□	■	□	■	■	■



—Editors' Choice

■—Yes

□—No

N/A—Not applicable: The product does not have this feature.

Drafix CAD Ultra/386

by Rod Taylor

When the job is 2-D CAD, *Drafix CAD Ultra/386* from Foresight Resources Corp. knows its business. Supported by a well-organized user interface, good documentation, powerful geometry creation and manipulation capabilities, and a library of 433 object symbols, *Ultra/386* offers power and performance the new user is sure to like.

The basic *Drafix CAD Ultra/386* package costs \$395. The *Ultra/386* upgrade (\$195) takes advantage of extended memory, giving you the ability to create larger, more-complex drawings than are possible using *Drafix CAD Ultra/386* alone. Foresight Resources Corp. also offers accessories, including a 3-D surface modeler, a raster-to-vector conversion utility, an IGES translator, thorough symbol libraries for architectural, mechanical, electrical, and computer network design, and a facility to generate customized reports from the drawing attribute data.

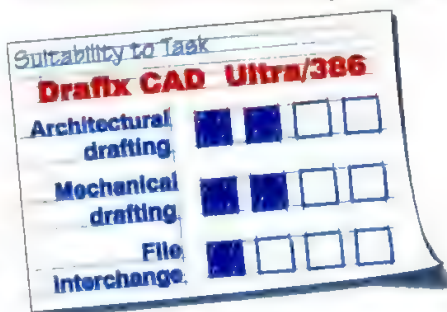
A DIFFERENT APPROACH TO DISPLAY

Ultra/386's display screen is well organized and packed with information. Divided into four areas, this screen offers a viewing window, a main function menu, sidebar menus, and a window for messages and text input. The viewing window occupies the lion's share of the screen and is used to display the current drawing view, pop-up text windows, and roll-down menus.

The main function menu, which appears along the top line of the screen, is used to issue commands to *Ultra/386*, while the sidebar menus along the left side of the screen are used to select drawing item attributes, to change views, and to control any coordinate, angle, and distance input.

The message-display and text-input window at the bottom of the screen presents status messages and prompts, and serves as the primary data-entry window. Once familiar with the display screen, you will want to look at some of the sample drawings included with the package. These seven modestly dimensioned and annotated drawings give you a good idea of the package's capabilities.

Ultra/386 also includes three manuals: a tutorial guide, a technical reference, and a symbols library. The tutorial includes 14 lessons ranging from basic setup of a new drawing environment to the plotting of finished drawings. The technical reference is useful for exploring details of specific operations within the *Ultra/386* environment; the symbols library provides an overview of the 433 symbols that



are included in the package.

You can position, scale, or rotate these symbols just like any other entity in the drawing environment. You can also alter the prepackaged symbols and create your own symbols.

There are a few areas in which *Drafix CAD Ultra/386* could use improvement. Considering the plethora of graphics card specifications that currently exist, the included list of 45 video drivers seems a bit dated. Our tested computer's graphics card (a Tseng 4000-based adapter) was not on the list, so *Ultra/386* had to be configured for a video mode lower than the 1,024-by-768 resolution the system is capable of running.

Creating the house floor plan and piston detail test drawings was relatively painless (drawing and editing the lines, arcs, and text was easy), but we encountered

FACT FILE

Drafix CAD Ultra 386
 Foresight Resources Corp.,
 10725 Ambassador Dr., Kansas City, MO 64153. 800-231-8574, 816-891-1040.
List Price: \$395.
Requires: 286-based PC or better, hard disk, mouse, DOS 2.11 or later. 640K RAM recommended.
In Short: Of the two offerings from Foresight Resources Corp., DOS-based *Drafix CAD Ultra/386* is the better choice. Moderately powerful and with a competitive price tag, the package performs well despite a few drawbacks, such as tricky cursor control.

CIRCLE 638 ON READER SERVICE CARD

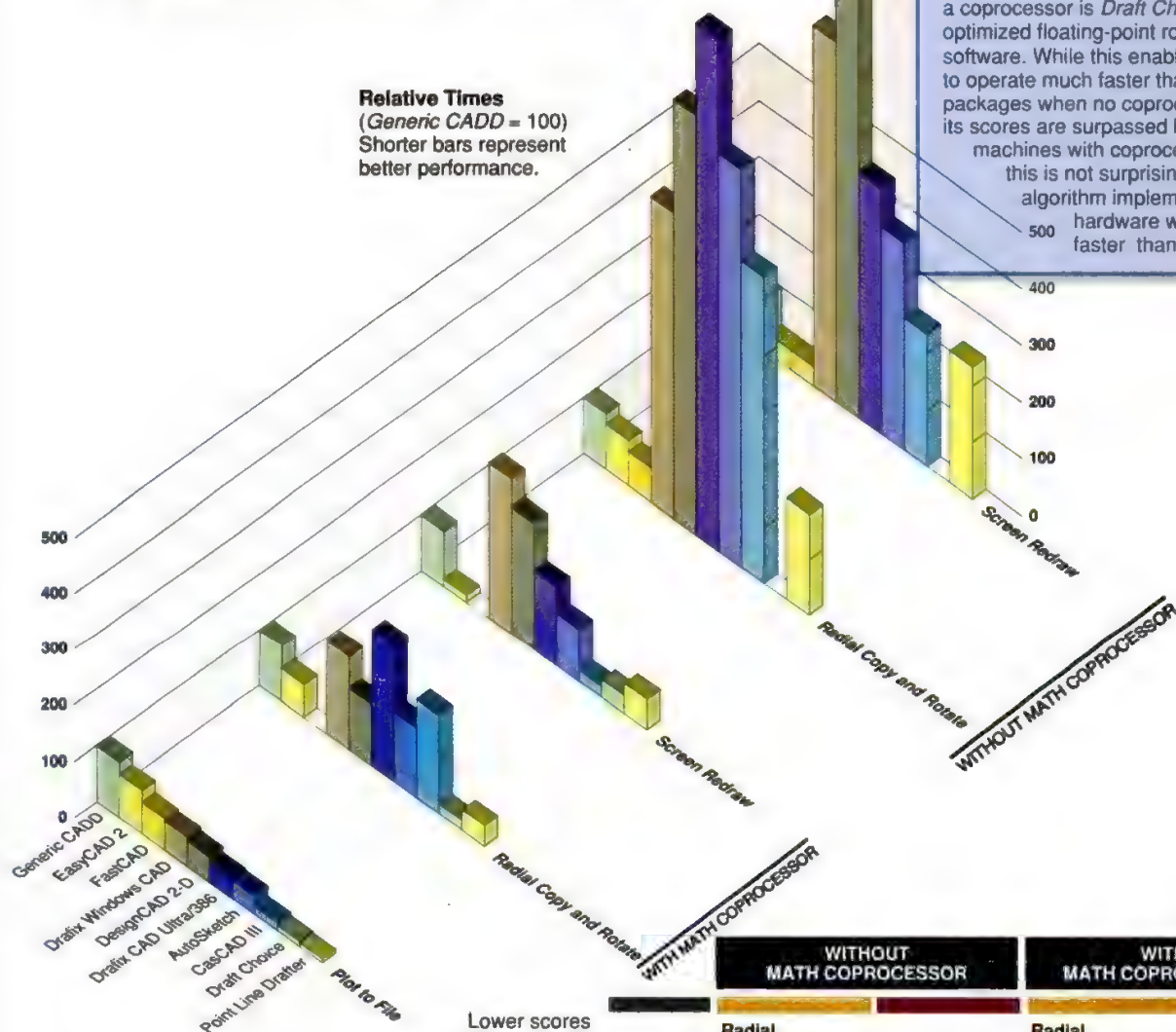
ENDS



PERFORMANCE TESTS: LOW-COST 2-D CAD PACKAGES

For those who lack a math coprocessor—and have no plans to purchase one—*Draft Choice*, *EasyCAD 2*, and *Point Line Drafter* were sufficiently fast to be useful. In a coprocessored environment, *FastCAD* and *EasyCAD 2* easily outpaced the competition, with *Generic CADD* coming in a strong third.

Relative Times
(*Generic CADD* = 100)
Shorter bars represent better performance.



Lower scores represent better performance.

	WITHOUT MATH COPROCESSOR			WITH MATH COPROCESSOR	
	Plot to File (seconds)	Radial Copy and Rotate (seconds)	Screen Redraw (seconds)	Radial Copy and Rotate (seconds)	Screen Redraw (seconds)
Generic CADD	205	65	37	5	3
EasyCAD 2	158	38	5	4	1
FastCAD	115	N/A*	N/A*	3	1
Drafix Windows CAD	106	108	102	27	19
DesignCAD 2-D	94	71	84	37	43
Drafix CAD Ultra/386	76	158	53	45	13
AutoSketch	70	81	35	35	11
CasCAD III	32	114	8	27	7
Draft Choice	21	12	12	N/A**	N/A**
Point Line Drafter	15	24	20	9	7

N/A*—Not applicable: This product requires a math coprocessor

N/A**—Not applicable: This product does not support a math coprocessor

WHAT THE NUMBERS MEAN

Unlike *AutoCAD*, which has separate commands for screen regenerating (recalculating the position of every entity in the drawing) and redrawing (simply redisplaying what is already on the screen), most of these packages treat a redraw as a regeneration. That explains why these packages have generally slow redraw times. For most packages, a math coprocessor can reduce the system's redraw time by anywhere from 49 to 92 percent, making it a highly recommended purchase for CAD work.

The only package that does not support a coprocessor is *Draft Choice*, which has optimized floating-point routines in software. While this enables *Draft Choice* to operate much faster than the other packages when no coprocessor is present, its scores are surpassed by a number of machines with coprocessors installed: this is not surprising, since an algorithm implemented in hardware will usually be faster than the same

algorithm in software. *Generic CADD* benefits most from a coprocessor; its speeds are reduced by more than 90 percent, which brings it to third place, behind *FastCAD* and *EasyCAD 2*.

At the other end of the spectrum, the two *Drafix* packages and *DesignCAD 2-D* are generally the slowest, although they do emerge in the middle of the pack on plotting speed. When we looked at plot file sizes (not reported in the graph), we found that *DesignCAD* also creates the largest plot files—375K for our test file—with *EasyCAD 2*, *FastCAD*, and *Generic CADD* following close behind. There seems to be no correlation between file size and plotting speed, however. The file size was determined more by the format in which a package wrote out its file. For instance, *Generic CADD* places each HPGL command on a separate line, while most of the other packages run the commands together in a semicontinuous string.

HOW WE TESTED

We performed all tests using the on-board VGA of a Compaq Deskpro 386/25e equipped with 8MB of RAM and a 320MB hard disk. For non-*Windows* packages, 4MB of the 8MB was configured as expanded memory using Compaq's CEMM memory manager, and an additional 3MB was devoted to a RAM disk. *Windows*-based packages were tested with a 2MB disk cache set up using SMARTDrive. For the Plot to File test, we used each package's driver for the Hewlett-Packard 7550A plotter, or its nearest HPGL equivalent.

■ To judge the speed and efficiency of each package's plotter driver, we perform a **Plot to File** test, in which we plot to disk a 36-copy polar array of a group of 15 lines, circles, and arcs. In all cases except for *FastCAD*, we ran this test without an Intel 80387/25.

■ The **Radial Copy and Rotate** test gauges the software's raw floating-point performance by measuring the time each package takes to create 72 copies of a group of entities comprised of lines, circles, and arcs in a polar array about a common center point (5-degree increments). For all the packages that supported but did not require a math coprocessor, we performed the test both with and without an Intel 80387/25.

■ To judge the **Screen Redraw** speed, we measure the time required to redisplay a screen containing a rectangular array of objects comprising more than 5,000 lines, circles, and arcs. For all the packages that supported but did not require a math coprocessor, we performed the test both with and without an Intel 80387/25.

tered problems, both in getting dimensions to behave correctly and in generating the heavy lines required in both drawings. *Ultra386* does not support tolerancing; it applies radius and diameter dimensions in a manner inconsistent with ANSI standards, and it cannot draw a heavy line in a simple operation. To draw such a line, you will have to perform an area fill within a closed polyline.

The program would also benefit from better cursor control over the function menus. The mouse cursor is relatively large compared with the text of the function menus, so you have to position the cursor carefully when selecting a function. When we panned or zoomed the active point marker outside the viewing window, the main function menu, sidebar menus, and text window often became contaminated with spurious X marks that made the menu partially illegible. When we tried to change the scale of the current drawing, the entire main function menu occasionally became corrupted with lines that made the menu text virtually unreadable. Performing a screen redraw does not resolve the problem; the only way to restore the screen to its normal condition is to switch to full-screen mode and back again.

Another problem is with *Ultra386*'s translator. *Ultra386* has difficulty reading .DXF files: It could read only one of our three .DXF import test files. The program introduced spurious dimension arrowheads and incorrect line types into the file and lost all radius and diameter dimensions. It filled polygons improperly and brought dimensions across at the wrong scale, if at all. Foresight Resources Corp. said that the translator's improper handling of associative dimensions will be fixed in the next release of the program.

These shortcomings aside, there is plenty to like about *Ultra386*. Among its strong points are function key macros, support of database attributes for symbols, and a simple report generator. The documentation provides plenty of accurate and useful information and the technical support representatives are cooperative and helpful. If you need a 2-D CAD system that offers ease of use and powerful geometry creation capabilities, take a look at *Ultra386*. If your work relies heavily on dimensioning or tolerancing, you should probably consider another package.

Drafix Windows CAD

by Paul Murphy

In its current incarnation, *Drafix Windows CAD* (\$695) is like an expensive diamond set in a brass ring. It is powerful and full-featured, but hampered by poor implementation and an awkward transition from its DOS-based origins to the *Microsoft Windows* environment.

Foresight Resources Corp. was the first CAD software vendor to recognize that *Windows* could provide fertile ground and moved early—in fact, prior to the release of *Windows 3.0*—to bring its DOS-based CAD product, *Drafix CAD Ultra386*, to Microsoft's GUI environment. Since then, Foresight Resources Corp. has retained much of *Windows 2.x*'s limited memory-handling and display capabilities, which is an advantage for users who must run *Windows* in Real or Standard modes. Other users will find that *Drafix Windows CAD* suffered in the translation.

Unfortunately, the current version of *Drafix Windows CAD* fails to take advantage of the most fundamental benefits of *Windows*: Its interface may look graphical, but it still feels character-based. For instance, rather than placing the typical CAD drawing tools in an icon-based toolbox, Foresight Resources Corp. has relegated them to drop-down menus on the *Windows* menu bar. You must control characteristics of elements, such as line type, width, and color, as well as layer, zoom, and angle/distance, through either the pull-down menus or the Screen Status Area, an area at the bottom of the screen



FACT FILE

Drafix Windows CAD
Foresight Resources Corp.,
10725 Ambassador Dr., Kansas City, MO 64153, 800-231-8574, 816-891-1040
List Price: \$695
Requires: 1MB RAM, hard disk, *Microsoft Windows 2.1* or later, mouse, 386-based PC or better recommended
In Short: *Drafix Windows CAD* possesses good database handling abilities and a full set of drawing tools; unfortunately, it does not make good use of its graphical environment. If you are looking for a *Windows*-based CAD program, wait for Version 2 of *Drafix Windows CAD*, which is intended to fix all the problems.

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- 7298 □ Hijaak 2.1 99.
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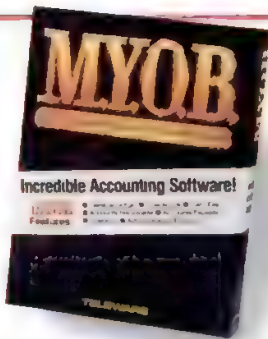
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of crowded malls?



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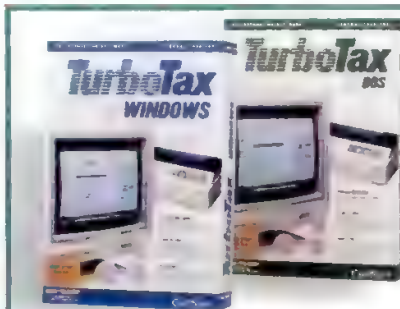
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1847	□ Ami Pro Competitive Upgrade	119.
1621	□ Freelance Graphics 4.0 for DOS	349.
2750	□ cc:mail DOS Platform Pack	125.
2748	□ cc:mail Windows Platform Pack	325.
2749	□ cc:mail 25 user Pack	379.
	MacroMind ... NCP	
3484	□ Action! 1.0 (3 1/2" only)	349.
	M-USA Business Systems ... NCP	
3408	□ Pacioli 2000 (Accounting software)	29.



MacroMind ... NCP

3484 **Action! 1.0**—Create dazzling multimedia presentations. Purchase between 11/1/91 and 12/31/91, send in your registration card along with a dated sales receipt and receive a \$100 rebate directly from MacroMind \$349.

	MECA ... NCP	
2798	□ Managing Your Money 7.0	\$99.
4603	□ Andrew Tobias' Tax Cut 1991	49.
	Micro Logic ... NCP	
6787	□ Info Select 2.0	95.
	Microcom ... NCP	
7649	□ Virex-PC 2.0	79.
6234	□ CarbonCopy Plus 6.0	119.
2718	□ Relay Gold for Windows	239.
	Microlytics ... NCP	
9636	□ Strunk & White Elements of Style 1.0	35.
7931	□ Random House Encyclopedia 1.0	68.
	Microsoft ... NCP	
3338	□ Money 1.0 for Windows	49.
2894	□ QuickBasic 4.5	69.
7010	□ Windows 3.0	99.
7388	□ Project 1.0 for Windows	459.
2904	□ Works 2.0	99.
2735	□ Works 1.0 for Windows	139.
3337	□ Publisher 1.0 for Windows	139.
2901	□ Word 5.5	209.
7387	□ PowerPoint 2.0 for Windows	329.
6195	□ Word 1.0 for Windows	329.
2856	□ Excel 3.0 for Windows	329.
8137	□ Office 1.6 for Windows	499.
2853	□ C Compiler 6.0	329.
1620	□ DOS 5.0 Upgrade	65.
1624	□ Visual Basic 1.0	139.



Chipsoft ... NCP

1663 □ **Turbo Tax Personal 1040 for 1991** (Headstart edition)—Everything you need; features over 80 forms, schedules & worksheets plus a tax planning module. Prints IRS-approved returns. Windows version & state packages avail. \$49.

	Multisoft ... NCP	
4925	□ PC-Kwik Power Pak 2.1	75.
	Nolo Press ... NCP	
5122	□ For The Record 2.0	35.
2982	□ WillMaker 4.0	39.
	Norton-Lambert ... NCP	
2753	□ CloseUp for Windows & DOS Dual Pack	129.
	OCR Systems ... NCP	
9878	□ ReadRight 3.0 for Windows	309.
	Okna ... NCP	
9696	□ Desktop Set 3.0 for Windows	85.
	PC Globe ... NCP	
5902	□ PC Globe 4.0	45.
5900	□ PC USA 2.0	45.

1-800/800-0004

MMC PC Connection 910M
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Marlow, NH 03456
SALES 603/446-7721 FAX 603/446-7791



Lotus ... NCP

2747 □ **1-2-3 for Windows & Ami Pro 2.0 Double Up™ Upgrade**—Upgrade from any PC release of 1-2-3 or any Lotus word processor to both 1-2-3 for Windows and Ami Pro 2.0! Available through 12/31/91 \$159.

	Personics ... NCP	
9288	□ Laptop Ultravision 2.1 (3 1/2" only)	49.
4384	□ Ultravision 2.0	79.
	PowerUp! ... NCP	
7860	□ Calendar Creator Plus 4.0	52.
7857	□ Labels Unlimited 3.0	49.
7858	□ Express Publisher 2.0	99.
7311	□ Form Publisher for Windows w/Fill & File	195.
	Qualitas ... NCP	
7539	□ 386MAX 5.12 (w/ASQ)	75.
7967	□ BlueMAX 5.12 for PS/2 (3 1/2" only) (w/ASQ)	85.
	Quarterdeck ... NCP	
3221	□ Expanded Memory Mgr. 386 6.0	65.
3220	□ DESQView 2.4	85.
4586	□ DESQView 386 2.4	145.
	QUE Software ... NCP	
4155	□ RightWriter 4.0	54.
1857	□ RightWriter 4.0 Network	165.
	Reality Technologies ... NCP	
7891	□ WealthStarter 2.0 w/Charles J. Givens	39.
6572	□ WealthBuilder 1.1	99.
	Reference Software ... NCP	
4396	□ Grammatik IV 2.0	59.
7483	□ Grammatik for Windows 2.0	59.
	Roykore ... NCP	
2473	□ Instant ORG Charting! 1.0	125.
8162	□ ABC Flowchart 1.1	189.
	Sitka ... NCP	
6675	□ TOPS Network Bundle 3.0	159.
3720	□ Flashcard 2.1 (AppleTalk network card)	155.
	Softlogic Solutions ... NCP	
3542	□ Software Carousel 5.0	55.
	Software Publishing ... NCP	
3496	□ Professional Write 2.2	169.
9638	□ Professional Write Plus 1.0	169.
3482	□ Harvard Graphics 3.0	419.
6600	□ Superbase 4 for Windows 1.3	529.
	Software Toolworks ... NCP	
9859	□ Word for Word 4.2 for Windows	47.
3290	□ Desk Reference Library	45.
	Solution Systems ... NCP	
7977	□ Brief 3.1 (Programmer's Editor)	189.
	Spinnaker ... NCP	
1415	□ PFS: WindowWorks 1.0	129.
7604	□ PLUS for Windows 2.0	289.
	Stac Electronics ... NCP	
1409	□ Stacker 2.0	89.
	Symantec ... NCP	
6397	□ The Norton Backup 1.2 (Windows/DOS)	89.
3146	□ The Norton Utilities 6.0	119.
3425	□ Q&A 4.0	269.

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Park at your phone



Tool Technology ... NCP

3863 **WinTools 1.0 for Windows**—Full object oriented. Customize with Image Librarian's 100 icons. Automate your work with icons that run programs and Big Sky's sixteen virtual screens (3 1/2" only) \$125.

RECREATIONAL/EDUCATIONAL

Abracadata ... NCP

- 3629 ☐ Design Your Own Home-Architecture 3.0 \$63.
- 3631 ☐ Design Your Own Home-Interiors 1.0 ... 63.
- 3638 ☐ Design Your Own Home-Landscapes 1.0 63.

Broderbund ... CP

- 8068 ☐ Where in World is Carmen Deluxe. 52.
- 1836 ☐ Where in America's Past is Carmen Sandiego 39.

- 5851 ☐ SimCity 33.
- 8886 ☐ SimEarth 45.

Electronic Arts ... NCP

- 4534 ☐ Mavis Beacon Teaches Typing 2.0 (CP) 35.
- 3031 ☐ Mavis Beacon for Windows 45

- 3023 ☐ ChessMaster 3000 35.

- 7865 ☐ PGA Golf 35.

- 1334 ☐ Chuck Yeager Air Combat Trainer. 42.

- 7372 ☐ World Atlas 2.0 42.

- 3050 ☐ World Atlas for Windows 57.

Harvard Associates ... NCP

- 2324 ☐ PC Logo 3.0 59.

HyperGlot Software ... NCP

(French, German, Italian, Spanish available.)

- ☐ Word Torture for Windows ea. 34.

- ☐ Word Torture 3.0 ea. 29.



Practical Peripherals ... 5 years

2264 **PM2400FX96 Fax Modem**—2400 bps internal modem with true 9600 bps send/receive capabilities. A Hayes compatible 1/2 card, it also allows you to receive faxes in the background, & includes QuickLink II. . \$145.

Walt Disney Computer Software ... CP

- 2629 ☐ Mickey's 123's 35.

- 2624 ☐ Mickey's ABC's 35.

HARDWARE

Warranties listed next to manufacturer.

American Power ... 2 years

- 7108 Smart UPS 400 339.

- 7105 Smart UPS 600 469.

- 6811 Back-UPS 360 185.

- 7106 Back-UPS 520 299.

ATI Technologies ... 2 years

- 9821 VGA Basic-16 (640 x 480, 16 colors) 69.

- 2706 VGA Wonder XL (w/1 MB) 239.

- 9985 VGA Integra (1024 x 768, 16 colors) 95.

- 2382 Graphics Vantage VGA (w/1 MB) 359.

- 9822 Graphics Ultra (w/1 MB) 559.

- 2012 Graphics Ultra w/VGA (w/1 MB) 619.

- 1825 2400etc/i Modem (w/9600 SendFax) 139.

- 9620 9600etc/e Modem 379.

- 3080 Stereo•F/X 149.

- 3076 VGA Stereo•F/X (w/512K, upgrd. to 1 MB) 329.

Boca Research ... 5 years

- 7001 BOCARAM/AT PLUS (OK) 119.

- 7150 BOCARAM/AT PLUS (2 MB) 219.

- 7139 (4 MB) 329. 7138 (8 MB) 539.

- 6998 I/O Board for AT 55.

- 6999 I/O Board for Microchannel (S/S/P) 109.

- 8380 BasicVGA (256K, 640 x 480) 63.

- 8381 SuperVGA (1 MB, 1024 x 768) 145.

- 3859 2400 Internal Modem 85.

- 3860 2400 External Modem 109.

Bravo Communications ... 2 years

- 7400 2 Position Laser Compatible Switch Box. 109.

Brown-Wagh ... 1 year

- 8578 Creative Labs Sound Blaster 115.

- 2336 Creative Labs Sound Blaster Pro 189.

Caere ... 1 year

- 8158 Typist Plus Graphics 389.

Canon ... 1 year

We are an authorized Canon Service Center.

- 7894 BJ-10ex Printer (4.6 lb.) 339.

- 7897 BubbleJet Ink Cartridge (BJ-10ex) 23.

- 7896 BJ-10ex Sheet Feeder 75.

Cardinal ... 1 year

- 2720 MB2450 Internal 2400 Baud Modem 69.

- 2719 MB2296SR Internal Send/Receive Fax. . 109.

- 2721 VGT732 True Color Ultra VGA Card 185.

CH Products ... 1 year

- 7801 FlightStick w/Falcon 49.

CoStar ... 1 year

- 1418 AddressWriter Envelope Printer 499.

Curtis ... Lifetime

- 1708 Ruby-Plus SPF-2+ 65.

- 7358 Command Center SPF-4 89.

- Glass Filter Plus (specify size) each 65.



Knowledge Adventure ... NCP

3861 ☐ **Knowledge Adventure 1.0**—Chart your own course of discovery through science, art, literature, music, geography. Needs only hard disk and EGA/VGA to access rich image/text base. For kids and adults! \$65.

Knowledge Adventure ... NCP

- 3861 ☐ Knowledge Adventure 1.0 65.

Microsoft ... NCP

- 7881 ☐ Entertainment Pack for Windows 1.0 .. 29.

- 2858 ☐ Flight Simulator 4.0 39.

- 8270 ☐ Aircraft and Scenery Designer 1.0 29.

Microsoft Press (Books)

- 8129 **Running Windows (2nd Edition)** 22.

Penton Overseas ... NCP

- ☐ VocabuLearn/ce Levels I & II (French, Italian, German, Spanish, Russian, Hebrew and Japanese) each 35.

Sierra ... CP

- 2767 ☐ Leisure Suit Larry V (VGA) 39.

- 9466 ☐ Space Quest IV (VGA) 39.

- 7972 ☐ King's Quest V (VGA) 45.

Software Toolworks ... NCP

- 3294 ☐ Game Pak (5 games in one) 32.

- 9860 ☐ Word for Word Professional 4.2 89.

Spectrum Holobyte ... NCP

- 3047 ☐ WordTris 27.

- 3457 ☐ Falcon 3.0 45.

Stone & Associates ... NCP

- 3435 ☐ Letters, Numbers, Words 22.

- 3439 ☐ 2nd Math 4.2 27.

Toyogo ... NCP

- 2701 ☐ Go Master 5.0 for Windows 39.

- 2703 ☐ Nemesis Deluxe Toolkit 5.0 75.

- 2704 ☐ Nemesis Deluxe Toolkit 5.0 for Windows 75.

True BASIC, Inc. ... NCP

- ☐ Kerny/Kurtz Math Series each 45.



Abracadata ... NCP

3629 ☐ **Design Your Own Home-Architecture 3.0**—Draw floor plans & structural details ... \$63.
3631 ☐ **Design Your Own Home-Interiors 1.0**—Draw room plans, arrange furniture & more 63.
3638 ☐ **Design Your Own Home-Landscapes 1.0**—Create complete landscape plans 63.

and give us a call.



Canon ... 1 year

7894 BJ-100x Printer—New enhanced version of the popular 4.6 lb. printer provides laser-like print quality (up to 360 dpi) on plain bond paper, envelopes or transparencies. Available in white or gray ... \$339.

Cyril Corporation ... 5 years

MATH COPROCESSORS

9875	FasMath 83D87-25	185.
9876	FasMath 83D87-33	195.
9877	FasMath 83S87-16 (SX compatible)	115.

Datadesk ... 3 years

6901	Switchboard (modular keyboard)	159.
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Epson ... 2 years

We are an authorized Epson Service Center.

1906	FX-850 (80 col., 264 cps, 9 pin)	319
1904	FX-1050 (136 col., 264 cps, 9 pin)	449
2358	LQ-570 (80 col., 252 cps)	289.
2361	LQ-870 (80 col., 330 cps)	489.
2357	LQ-1170 (136 col., 330 cps)	669.
5184	LX-810 (80 col., 180 cps, 9 pin)	185.

Everex ... 1 year

1683	Tempo LX Notebook (5 MB, 60 MB HD)	2899.
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Hauppauge Computer ... 1 year

9870	25 MHz 386N Motherboard for AT	899.
9034	33 MHz 386N Motherboard for AT	979

Hayes ... 2 years

7391	Ultra 96 Modem	669.
3522	OPTIMA 96	479.
9884	Pocket Edition 2400	125.

Hewlett-Packard ... 1 year

9993	LaserJet IIIP (with toner)	1149.
6754	LaserJet III (with toner)	1679.

Hitachi ... 2 years

9492	14MXX/LMF 14" SVGA Monitor (1024 x 768) (with low radiation screen)	489.
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Intel ... 5 years

3864	1.44EX Modem	549
6421	2400B MNP Internal Modem	189.
6420	2400EX MNP Modem	225.
7880	9600EX Modem	499.
2346	Neobord 386/PC with 1 MB	495.
5336	Above Board Plus 8 2 MB	449.
5342	Above Board Plus 8 I/O 2 MB	479.
7782	SatisFAXtion (fax board)	389.
8778	SatisFAXtion for Microchannel	449.
8903	Matched Memory 4 MB (PS/2)	299.
	Matched Memory (for LaserJet IIP, III, IIIP IIID)	
1810	1 MB	99. 1787 2 MB
1637	Snap-In 386	389

3358	Power Pak (Snap-In 386 & Above Board Microchannel 4 MB)	925.
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MATH COPROCESSORS

7385	80287XL (16 MHz 80286 CPU's)	89
4750	80387SX (16 MHz 80386SX CPU's)	129.
6830	80387SX-20 (20 MHz 80386SX CPU's)	145.
5409	80387-33 (80386DX CPU's)	219.

Kensington Microware ... 1 year

2582	Master Piece Plus	\$99.
7899	Expert Mouse serial	119. 7900 bus
3312	LaserStand	125.
3311	MasterStand	59.

Keytronic ... 3 years

4518	101 Plus Keyboard	99.
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Kraft ... 5 years

5801	Game Card (2 ports)	27
5813	Game Card w/Thunderstick	49.
5800	3 button Thunder Joystick	29.
7862	TopTrak (Laptop Trackball)	55

Logitech ... limited lifetime

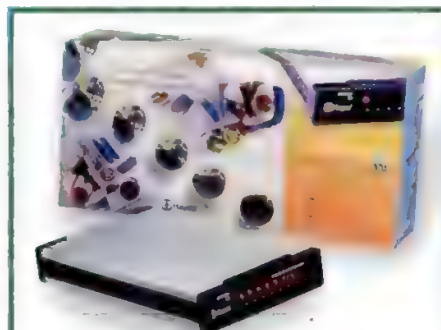
6029	Trackman serial	75. 6028 bus
2343	Trackman Portable	105
1484	ScanMan 32	169
7975	ScanMan 256	289.
3295	MouseMan (combo)	75 9766 (cordless) 89.

Megahertz ... 5 years

1193	T324D 2400 Modem (for Toshiba Laptops)	129.
1196	T224 2400 Modem (for Toshiba Laptops)	129.
1187	T324FM 96/24 Fax Modem (Toshiba Laptops)	299.
1199	T52CC - 2 MB Upgrade for Toshiba T1000 series or T2000SX	239.

Micron Technology ... 2 years

7595	2 MB Expansion for HP LaserJet IIP or III	119
7012	Memory Upgrade PS/2 70 - 2 MB	139.



Hayes ... 2 years

3522 OPTIMA 96—Get Hayes performance and reliability at a terrific price! Supports V.32 9600 bps operation with V.42bis data compression for speeds up to 38,400 bps. ... \$479.

Microsoft ... lifetime

7597	Microsoft Mouse (bus or serial)	89.
2897	Mouse with Paintbrush (bus or serial)	105.
2898	Mouse with Windows 3.0 (bus or serial)	149.
1956	Mouse with Works (bus or serial)	155
1896	Ballpoint Mouse (serial only)	119.

MicroSpeed ... 1 year

2763	MicroTRAC (serial & PS/2 interface)	59
	PC-TRAC Trackball	
6007	serial	75. 6008 bus
7271	Import	79. 6330 PS/2

Mouse Systems ... lifetime

5997	Trackball (1 yr. wrnty.) serial	65. bus
3213	PC Trackball II (serial)	69
7878	PC Mouse III (serial)	89. (bus) 95.

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TIMESLIPS ... NCP

2987 □ Timeslips III 4.0—Know exactly who owes you what with this time and expense billing system. Perfect for service professionals (accountants, lawyers, etc.) who need to track and bill their time ... \$195.

NEC ... 2 years

9441	CDR36 Portable CD-ROM Drive	399
4799	Multisync 2A (VGA Monitor)	439
5085	Multisync 3Ds Monitor	619.

Orchid Technology ... 4 years

7863	ProDesigner VGA IIS (with 1 MB, includes RAMDAC chip)	249.
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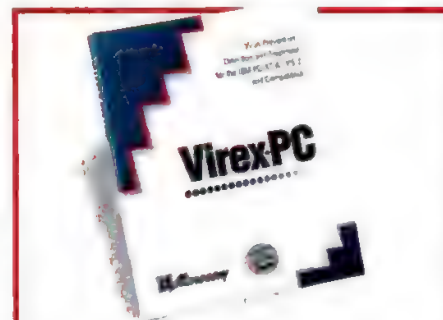
PC Power & Cooling ... 1 year

REPLACEMENT POWER SUPPLIES

3203	Turbo Cool 200	149.
7915	Turbo Cool 300	165.

Pacific Data Products ... lifetime

6779	25 Cartridges in One! (for LJ II, IIP, III)	275.
2255	Fontbank (0.75 MB)	225.
3491	Fontbank (1.5 MB)	299
8975	Complete Font Library (for LJ/III)	275.
	Memory upgrade for LaserJet IIP/III:	
7055	2 MB	149. 7759 4 MB
	Memory upgrade for LaserJet II/IIID:	
6838	2 MB	249. 6836 4 MB
8091	Pacific Connect with 256K	275.
8090	Pacific Connect with 1 25 MB	349.
7158	Pacific Page PE 4.1 (for LJ IIP/III)	379.
6834	Pacific Page (for LJ II) w/2 MB Mem. Brd.	379.
9833	Pacific Page XL (w/accelerator board)	799.



Microcom ... NCP

7649 □ Virex-PC 2.0—Powerful, comprehensive solution to DOS-based computer viruses. Featuring: MiniScan TSR for continuous virus protection, Windows & Network compatible, less than 1K & detects over 450 viruses. ... \$79.

No hustle or hassle.

Practical Peripherals ... 5 years

3103	2400 Baud Internal Modem	\$85.
3102	2400 Baud External Modem	179.
8993	2400 Baud Internal Modem (V.42 bis)	169.
8994	2400 Baud External Modem (V.42 bis)	199.
4542	2400 Baud Internal Modem for PS/2	229.
8132	PM2400 Pocket Modem	109.
2266	PM9600 Internal Modem	399.
7934	PM9600SA Modem	469.
2264	PM2400FX96 (modem/fax board)	145.

Targus ... lifetime

1305	Universal Notebook (for ntbk. computers)	69.
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TheComplete PC ... 2 years

8082	Half Page Scanner/400 w/ReadRight	289.
5828	TheComplete Communicator	319.

Toshiba ... 1 year

3359	T2000SX Notebook (60 MB)	3299.
3360	T2000SXE Notebook (40 MB)	3399.
3361	T2000SXE Notebook (60 MB)	3649.
1779	T3100SX Laptop (80 MB)	3199.
1773	T3200SX Laptop (120 MB)	3499.

Tripp Lite ... 2 years

6199	Isobar 4-6 (4 outlets, Gold Seal Warranty)	49.
6200	Isobar 6-6 (6 outlets, Gold Seal Warranty)	59.
6201	Isobar 8-12 (8 outlets, Gold Seal Warranty)	69.
6018	LC1200 (1200W line conditioner)	159.
1528	PS6 0 (600VA on-line UPS)	559.

Video 7 ... 7 years

9768	VRAM II VGA 1 MB	329.
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Zoom Telephonics ... 7 years

1307	Int. 2400 Baud w/9600 Baud Fax Modem	109.
1178	Ext. 2400 Baud w/9600 Baud Fax Modem	119.
1170	2400 Baud w/4800 Baud sendfax	69.
1181	2400 Baud V.42bis Modem (2 year)	129.
1167	2400 Baud Internal Modem	65.
1166	2400 Baud External Modem	75.
3075	9600 V.32 Turbo Internal Modem (2 yr.)	399.

Plus Development ... 2 years

8304	Hardcard II XL 50 MB (9 ms)	\$399.
8287	Hardcard II XL 105 MB (9 ms)	599.

Seagate ... 1 year

4554	40 MB Internal HD ST251-1 (28 ms)	249.
1321	ST157A 40 MB IDE Hard Drive	229.
1320	ST1144A 130 MB IDE Hard Drive	459.

TEAC ... 1 year

4670	1.44 MB Drive for PC/XT (3 1/2")	69.
4326	1.44 MB Drive for AT (3 1/2", w/Basetech)	89.
4951	720k Drive for PC/XT (3 1/2")	69.
6951	1.2 MB Drive for AT (5 1/4")	75.

MEMORY

6556	256k DRAM (100 ns, set of 9)	call
5510	1 MB x 9 SIMMs (80 nanosecond)	call
2497	4 MB x 9 SIMMs (80 nanosecond)	call
5746	1 MB Chips (80 ns, set of 9)	call
7813	256K x 4 Chips	call



Boca Research ... 5 years

Fast & affordable, these modems provide many powerful features—at pleasantly surprising prices. Both are backed by a 5 year warranty.

3860	2400 External Modem	\$109.
3859	2400 Internal Modem	85.

IOMEGA ... 1 year

2224 Bernoulli II Transportable 90 MB—Rugged and built to last, this drive will absorb 1000 g's of shock and provide 90 MB of portable storage. Awards from Byte and InfoWorld. Requires adapter card

DRIVES

Conner Peripherals ... 1 year

8875	CP3044 40 MB IDE HD (25 ms)	219.
2339	CP30104 120 MB IDE HD (19 ms)	399.
1337	CP3204 200 MB IDE HD (16 ms)	629.

IOMEGA ... 1 year

We are an authorized Iomega Service Center.

2224	Bernoulli II Transportable 90 MB	799.
2616	Internal 90 MB Bernoulli	799.
2500	PC2B Controller	199.
2530	90 MB Cartridge	149.
2467	90 MB Cartridge Tripak	439.

Mountain Network Solutions ... 2 years

2917	40-60 MB Internal Tape Drive	259.
5190	DC2000 Pre-matted Cartridges	ea. 35.
6153	DC2120 Tape Cartridge (5 pack)	149.

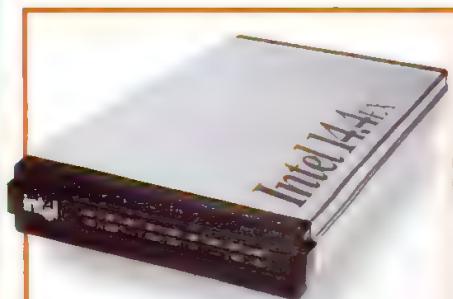
Pacific Rim ... 1 year

1304	1.2 MB External (for any parallel port)	239.
6602	1.44 MB External (for PC/XT/AT)	239.

6375	3 1/2" DS/HD (3 Pack)	\$49.
8185	QD2040 Tape Cartridge	19.
1895	QD2120 Tape Cartridge	22.
6715	QD6150 Tape Cartridge	27.
3M ... lifetime		
3943	DC 2000 Tape Cartridge	19.
6065	DC 2080 Tape Cartridge	25.
3944	DC 600 Tape Cartridge	29.
5679	DC 6150 Tape Cartridge	29.

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- If we must ship a partial order, we never charge freight on the shipment(s) that complete the order (in the U.S.).
- No sales tax, except Ohio residents (please add applicable tax).
- All U.S. shipments insured; no additional charge.
- APO/FPO orders shipped 1st Class Mail.
- International orders U.S. \$250 minimum. Manufacturer support and upgrade eligibility may be limited outside the U.S.A.
- Upon receipt and approval, personal and company checks clear the same day for immediate shipment of your order.
- COD max. \$1000. Cash, cashier's check, or money order.
- 120 day limited warranty on all products. Defective software replaced immediately. Defective hardware repaired or replaced at our discretion. All items subject to availability. Prices and promotions subject to change without notice.
- To order, call us Monday through Friday 8:00 a.m. to 1:00 a.m., or Saturday 9:00 a.m. to 5:30 p.m. Eastern Time. You can call our business offices at 603/446-3383 Monday through Friday 9:00 a.m. to 5:30 p.m.



Intel ... 5 years

3864 14.4EX Modem—Intel's fastest modem! Features 14.4Kbs throughput (up to 57.6Kbs with compression), 16 MHz 80188 automatic error correction with Trellis Coded Modulation, and automatic speed optimization

Quarterdeck ... NCP

3221 Expanded Memory Manager 386 6.0—Gain up to 200K or more of previously unusable memory. Incl. automatic memory conversion, full compatibility with Windows, & speed optimization of memory (w/Manifest).

DISKS/MEDIA

Maxell ... lifetime

2790	5 1/4" MD2-D 1.2 MB Diskettes (Qty. 10)	15.
2792	3 1/2" DS/DD 720k Diskettes (Qty. 10)	13.
2793	3 1/2" DS/HD 1.44MB Diskettes (Qty. 10)	21.

Sony ... lifetime

3291	5 1/4" DS/DD 360k Disks (Qty. 10)	8.
3297	3 1/2" DS/DD 720k Diskettes (Qty. 10)	11.
3298	3 1/2" DS/HD 1.44 MB Diskettes (Qty. 10)	18.
6148	3 1/2" DS/DD (3 Pack)	29.

SHIPPING

Note: Accounts on net terms pay actual shipping.

Continental US:

- For heavy hardware items such as printers, monitors, Bernoulli Boxes, etc. pay actual charges. Call for UPS 2nd-Day & Next-Day-Air.
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Things will really start hopping around your office when you get your supply of PC Connection Popcorn on the Cob. We're sending some free to everyone who places an order for \$750 or more between now and December 31. Just put a cob in the bag, place it in your microwave, and out come three cups of popcorn. What an earful!



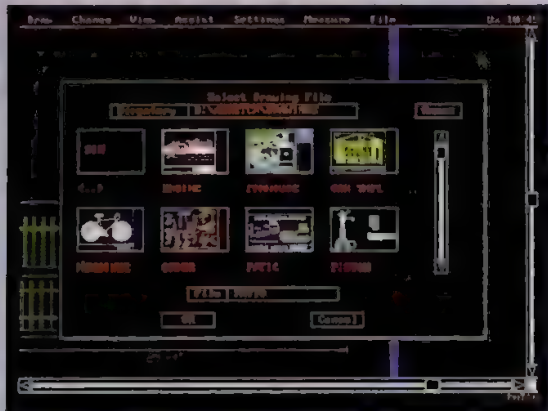
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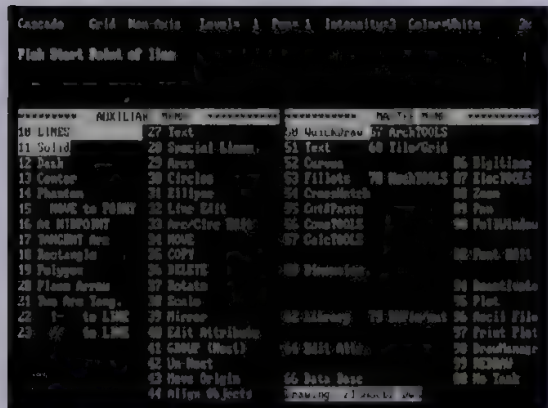
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2-D CAD SOFTWARE: Getting the Look and Feel

A drawing is a drawing is a drawing, but a CAD package's visual interface plays a key role in determining its ease of use. Our ten programs offer a number of distinct approaches to selecting commands and specifying input.



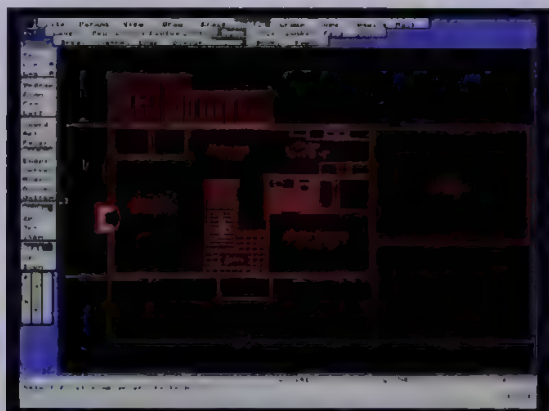
When you open a drawing or import a symbol in *AutoSketch*, you get to pick from a menu that displays an iconlike depiction of drawings and symbols. Most packages make you select from a list of filenames.



With *CasCAD III* running in a dual monitor setup, you get a full-screen display of expanded, easily navigable menus. Unfortunately, the menu structure suffers from haphazard layout.



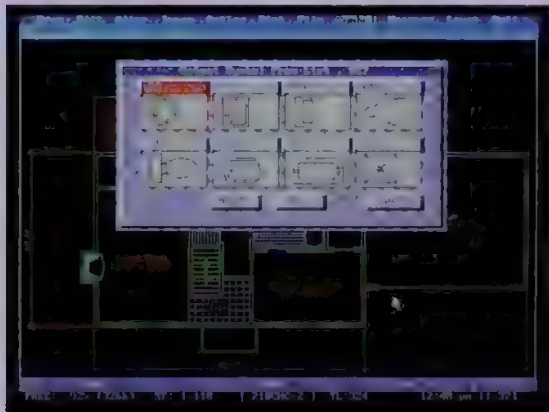
DesignCAD 2-D offers a multitude of input options. Pull-down menus, a command line interface, user-definable icons, and a digitizer with a command set overlay can all be active at once.



Draftix CAD Ultra 386 organizes the screen into four areas. The main function menu, along the top of the screen, is used to issue commands; the sidebar menus on the side are used to pick attributes.



The unmarked buttons at the bottom of the *Draft Windows CAD* screen may frustrate new users. Once you are familiar with their functions, however, the buttons permit quick access to dialog boxes that make it easy to change any drawing parameter.

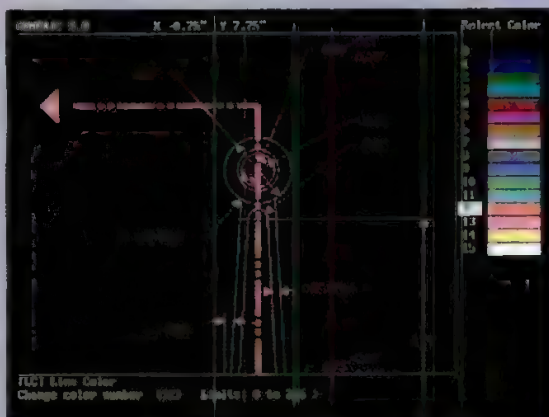


Draft Choice lets you select symbols pictorially, eliminating the need to remember obscure filenames.

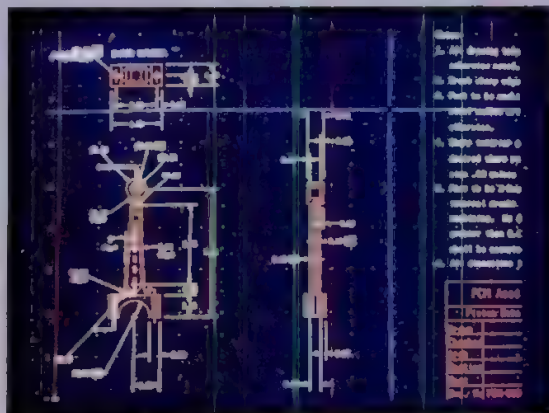
GRAPHICS LOW-COST 2-D CAD



Most of the options in *EasyCAD 2* and *FastCAD* are handled through dialog boxes like this one, which controls the settings of grids, snaps, and other parameters.



In most cases, *Generic CADD* permits you to respond to its input prompts by pointing rather than typing. Here, the palette of 16 colors available is displayed while *Generic CADD* awaits the user's input. You can also select a color by pressing the Equal Sign key and pointing to a line on the screen that is drawn in the desired color.



This is one of *Point Line Drafter's* viewing options, in which the drawing geometry shares the display area with a one-line command prompt. The user can also opt to see full menus.

filled with unnamed buttons. These buttons, which are not identified by text or icons, contain numbers, colors, or snap-point types. They are unintuitive and annoying, though if you use them often enough, you will probably become familiar with their functions.

The method for selecting tools and elements is equally cumbersome. Since there is no toolbox, you will need to deselect a tool with the right mouse button before you can select another with the left Mouse button. There is a Left/Right Mouse prompt to help you keep the process straight, but you will probably do a lot of fumbling around just to change tools.

Drafix Windows CAD uses the *Windows* Clipboard for cut-and-paste operations, but it complicates matters with extra steps. Snap points are also something of a problem. Although you can change them from the keyboard during the drawing process easily, you cannot select them with the mouse easily.

Despite these implementation shortcomings, *Drafix Windows CAD* boasts a rather impressive set of features, which may persuade you to overlook its flaws. The program includes a full complement of drawing tools and controls. While it does not support user-defined line types, line-end types, widths, or hatch patterns, the supplied sets are probably sufficient for most purposes. The program gives you enough control over units of measurement, precision, and associative dimensioning to make it equally useful for architectural, mechanical, and civil engineering drawings. The various tools for trimming

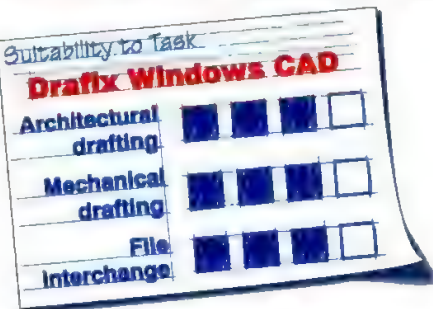
Drafix Windows CAD
uses the *Windows*
Clipboard for cut-and-paste operations, but it complicates matters with extra steps.

lines and entities are particularly well implemented. You can cut or trim lines in relation to intersecting elements, extend or trim corners interactively, and perform the usual chamfers and fillets.

The package also includes Foresight's *Drafix Graphics Language (DGL)*, a C-style programming/macro language you can use to automate repetitive tasks and to customize settings.

DEFT DATABASE HANDLING

Drafix Windows CAD excels at handling databases. You can turn each object or line into a record in a database that tracks objects. This is particularly useful for drawings used for inventory tracking, facilities management, or construction planning. Any updates to the drawing are automatically reflected in the database. Conversely, you can graphically high-



light database records in the drawing by specifying them from a list of fields. The database can then be exported in either ASCII delimited or *Microsoft Excel* format, although at present there are no facilities for linking the data externally to *Excel* or other *Windows* applications through DDE or OLE.

Many of these problems will be fixed in Version 2.0, which should be available by the time you read this. Foresight Resources Corp. has performed a near-miraculous overhaul of the user interface,

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PC Computing
July 1991
MS-DOS 5 Review

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GRAPHICS

LOW-COST 2-D CAD

providing an expandable on-screen toolbox much akin to that of *CorelDRAW*. Version 2.0 also adds traditional support for the *Windows* Clipboard, allowing you to cut-and-paste text and metafiles from and to the Clipboard. The company has also set up an upgrade procedure for current *Drafix Windows CAD* users.

If you need a reasonably priced *Windows*-based CAD drawing package, you would do well to wait for Version 2.0, which should provide the boost *Drafix Windows CAD* needs to make it truly useful for a wide range of CAD applications.

Draft Choice, Version 1.51d

by Will Schleter

Draft Choice, from Trius, isn't powerful enough to use as a full-time drawing tool, but for simple, accurate sketches or as an introduction to CAD, it certainly is a cost-effective choice. You can try out this easy-to-use shareware program for nothing and if you find it useful send in the \$50 shareware registration fee. This buys you the latest version of the software, the printed manual, and a utilities disk.

Draft Choice installs quickly and easily on any 286-based PC or better with at least 320K of RAM, 1.3MB hard disk space, and a CGA graphics adapter. You have the option to use a mouse (or a digitizing tablet emulating a mouse). The program does not support a math coprocessor because, according to the manual, the internal routines are highly optimized so as not to benefit from a coprocessor. As our performance tests indicate, it is one of the faster packages when compared with those without a coprocessor, and falls into the top half of the group compared with the packages that do utilize one.

Draft Choice supports a limited number of generic graphics cards and an equally limited number of output devices. It does support expanded memory, however, and it can even use a hard disk or a RAM disk to simulate up to 4MB of expanded memory.

SIMPLE NAVIGATION

The *Draft Choice* screen is efficiently laid out, with a single line of pull-down menus across the top and a status line and an input line across the bottom. Using the mouse to



FACT FILE

**Draft Choice,
Version 1.51d**

Trus Inc., P.O. Box 249,
North Andover, MA
01845; 508-794-9377.

List Price: \$50
(shareware registration
fee), plus \$5 shipping
and handling

Requires: 286-based PC or better, 640K RAM,
DOS 2.1 or later. Mouse recommended

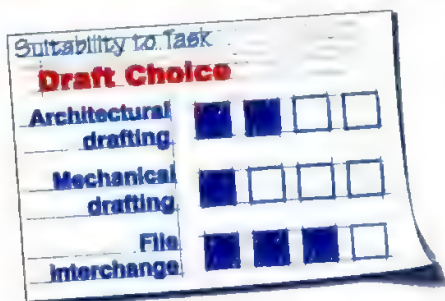
In Short: *Draft Choice* is a compact, easy-to-use
system that works well for simple drawings.
Unfortunately, its limited dimensioning
capabilities make this program unsuitable for
detailed drafting work.

CIRCLE 640 ON READER SERVICE CARD



select a menu option is cumbersome, because you must back completely out of the current menu before you can select another top-level menu. To make matters worse, when you exit a top-level menu, the cursor jumps to the last position on the drawing and you must move the mouse back up to the menus at the top of the screen to make the next selection. Your best bet is to learn the single-letter sequences for all of the commonly used menu options and avoid using the mouse for menu selection.

You can specify coordinates with the grid snap feature or by entering absolute, relative, polar, or bearing (relative polar) coordinate values. You can also specify a mathematical expression or use orthogonal and isometric modes to aid you in constructing objects. *Draft Choice* supports all types of 2-D geometry, but construction methods are limited to the basic forms. There are no options for perpendiculars, tangents, or intersections, which made creating the piston detail geometry in a test drawing difficult and time-consuming. Many operations require you to convert arcs and splines to complex lines (poly-



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Paul Bonner
PC Computing
July 1991

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“Transition to MS-DOS 5 is proving to be as painless as promised.”

Stuart J. Johnston
InfoWorld
July 29, 1991

Microsoft

GRAPHICS

LOW-COST 2-D CAD

Draft Choice is a good choice if you need a 2-D CAD system that is easy to learn and use.

lines) before you can use them. Creating cross-hatching in the test drawings was much more laborious than it needed to be due to this restriction. *Draft Choice* does provide a unique parameterized curve function that lets you define a curve shape by providing parameterized equations for the x- and y-coordinates of the curve over a specific parameter range.

Draft Choice is regrettably limited in its dimensioning capabilities. While you can easily place one or two simple dimensions, you cannot control where a dimension is placed or what it looks like well enough to make the system suitable for detailed dimensioning work. As an example, virtually all of the dimensions on the piston detail test drawing had to be created with individual lines, arrows, and text in order to achieve the desired results.

Despite its strengths, *Draft Choice* is an uneven program. It features a super-smooth rubber-banded display that is a big plus for visualizing the results of an operation before it is performed and an extremely easy method for selecting a symbol from a pictorial display. You can restrict the display of text, line styles, and fill areas to speed up the many screen redraws you will perform while creating a drawing, but the program cannot zoom or pan during another operation, which severely limits its usefulness for detail work. Worse, it is much too easy to modify or delete something inadvertently from a layer that is not visible. The manual suggests you use the Protect Layer feature to avoid this sort of potential disaster, but the availability of only eight layers, the extra steps involved in protecting the layers, and the magnitude of the damage that could be done to the drawing make this an accident waiting to happen.

The program can convert files to and from .DXF, HPGL, and Lotus .PIC formats, so it is a good fit with word processors, spreadsheets, and other CAD packages. Because of this flexibility, *Draft*

Choice is a good choice if you have only an occasional need for a 2-D CAD system that is easy to learn and use. It is an excellent example of high-quality shareware, and despite its limitations, it could hardly fail to be an attractive value.

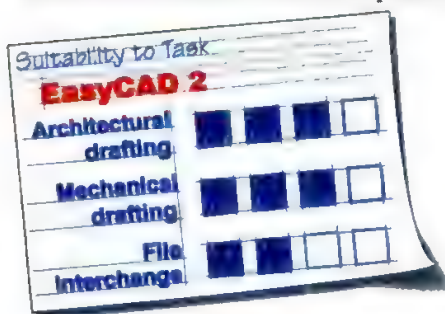
EasyCAD 2 FastCAD

by Jeff Prosser and Jim Ryan

What would you say if someone offered you one of the fastest and most powerful CAD programs on the market for \$795, and then told you that you could buy a trimmed-down version of the same program with most of the features intact for \$199? It may sound too good to be true, but that's what you get when you buy *FastCAD* (\$795) or *EasyCAD 2* (\$199), a duo of packages from Evolution Computing that are so fast, they are the only packages in this review we could possibly recommend for use with an 8088.

Both products rank among the fastest and most powerful CAD products in the under-\$1,000 market. Evolution Computing does not take speed lightly; *EasyCAD* and *FastCAD* consistently placed at the top on PC Magazine Labs' performance tests. Moreover, neither package sacrifices power for the sake of speed. Both programs offer an impressive list of features that include, among other things, a diverse assortment of drawing and editing commands, .DXF translation capabilities, customizable menus, and support for scripts and macros.

Installing either package is a snap, thanks to no-nonsense installation programs that guide you through the process and copy the necessary files and drivers to your hard disk. *EasyCAD* and *FastCAD* support virtually all the popular video adapters, printers, plotters, and pointing devices on the market. *FastCAD* requires a



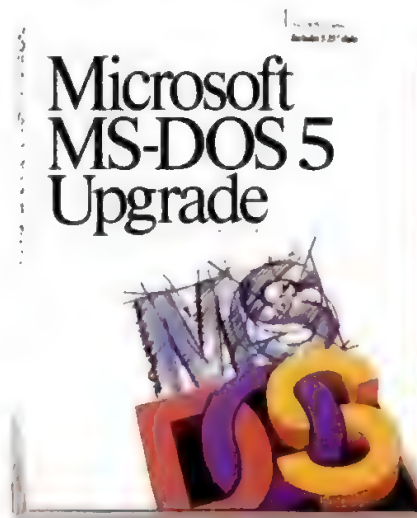
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"Working with the Megacube is sheer joy...It gives me everything I'm looking for," said the reviewer.* Such unequivocal praise is no overstatement. Because with the STEP Megacube, Everex has achieved not one design breakthrough — but several.

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The powerful combination of Intel's hot i486™/33 CPU chip and Everex's proprietary Advanced Memory Management Architecture (AMMA™), a second level cache of up to 256K, makes for a warp speed of 20.8 MIPS.**

And with 12 expansion slots, 8 drive bays, a 400-Watt power supply, and up to 64MB of memory—enough for even the most demanding applications—the STEP Megacube has more expansion capabilities than any computer on the market today.



THE ULTIMATE PC IS THE IDEAL FILE SERVER.

Everex has designed a powerful network server specifically to meet the requests of network and multiuser system administrators like yourself. Not only do you want a topnotch server that's expandable and performs well, but you also want reliability and serviceability.

In the STEP Megacube, you'll find everything you asked for and more. For example, recognizing that security is all-important on a network,

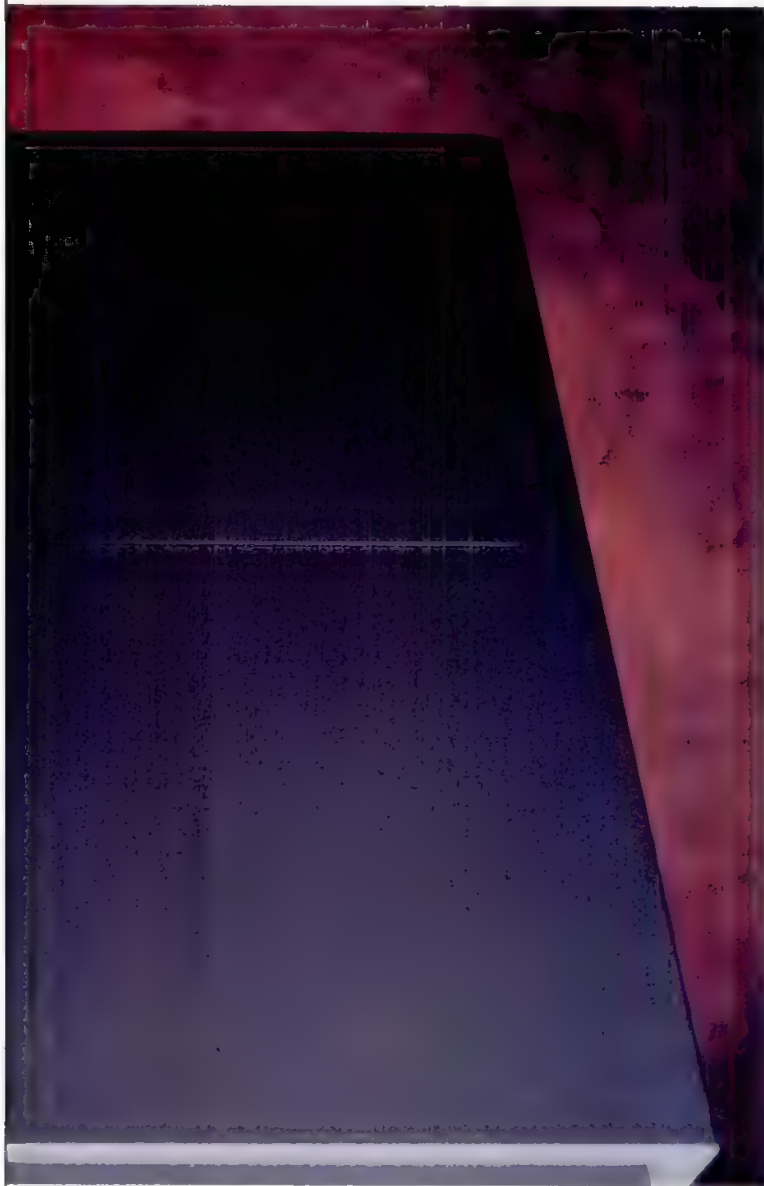


The STEP MegaCube is the first system to incorporate advanced thermal management to prevent problems caused by overheating. The Everex Thermal Management

STEP MEGACUBE 486/33

- | | |
|--------------------------------------|---|
| ■ 20.8 MIPS | ■ Everex Thermal Management System (ETMS) |
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| ■ 8 Half-height drive bays | ■ Chassis locks |
| ■ Up to 64MB of RAM | ■ Password protection |
| ■ 256K Cache | ■ Upgradeable to future-generation motherboards |
| ■ 10 of the expansion slots are EISA | |
| ■ 400 Watt power supply | |

personal computing.



Everex has built in password protection to ensure that data remain safe from unauthorized users. And the STEP Megacube is even available preconfigured for Novell® Netware.

A COMPANY THAT'S ALWAYS A STEP AHEAD.

But file serving is not all the Megacube was designed for. On the contrary, this multifaceted computer performs equally well as a graphics workstation and multiuser system. You won't find a more versatile system anywhere, nor one with so many design firsts.

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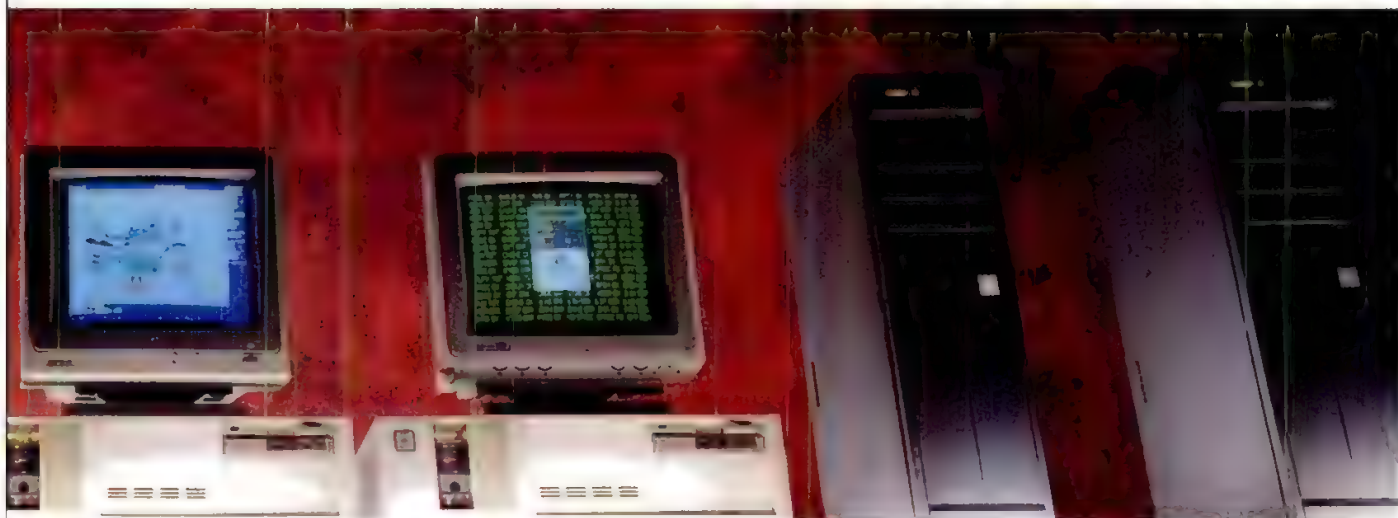
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† on-site service also covers all Everex peripherals in the computer system

veral steps in the irection.



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and error messages in English—not code. So problems can be identified and remedied faster, resulting in less downtime.

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Detailed status and error messages appear on the STEP's LED display in English—not in computer code—so troubleshooting time is shortened.

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we sell. In fact, Dataquest*** recently rated Everex number one in customer satisfaction.

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math coprocessor; *EasyCAD* can also benefit from one, but it is not required.

During installation, you can choose large or small prompt text. If you choose large, *EasyCAD* and *FastCAD* display menus and prompts in oversize characters that are approximately equal in size to the characters displayed on a 40-column text-mode screen. This makes these products a good choice for laptop users whose small screens may make normal text difficult to read. Both packages include sample and tutorial drawings that you can copy to your hard disk during installation. Once you have set up the software, the well-written tutorials can help you get acquainted with the *EasyCAD*/*FastCAD* way of working.

TWO OF A KIND

There are more similarities than differences between the two packages: Even their screens are nearly identical. Both share a user interface centered around pull-down menus, pop-up dialog boxes, and a command line. You can choose a command from the menus or enter one at the command prompt; you may also assign often-used commands (or sequences of commands) to the function keys through a built-in macro facility. A color bar for selecting the current drawing color runs down the left side of the screen, so you can switch to any of the 16 colors *EasyCAD* and *FastCAD* support with a single mouse click.

The *FastCAD* screen features one important element that the *EasyCAD* screen



does not: an icon bar containing 19 miniature command icons that you can execute with a single mouse click. These icons launch zooms, invoke the help screens, and control layers, line styles, fill styles, grids, snaps and other drawing aids, and the views displayed in the drawing area. (*FastCAD* permits up to eight different views to be displayed simultaneously; *EasyCAD* permits only one.) Commands accessed through the icon bar do not interfere with commands already in progress, so you can use them even if you are in the middle of a drawing operation. This is not true of commands invoked from the overhead menus or entered on the command line.

FastCAD also has some sophisticated capabilities that *EasyCAD* lacks. In addition to the icon bar and multiple views, *FastCAD* gives you enhanced plotting capabilities, code that is optimized for individual CPUs and math coprocessors to gain a slight additional edge in speed, and the ability to link external routines into the program using a separate module known as the XP (External Procedure) Toolkit. *FastCAD* also supports an entity known as a multipoly, which makes hatching less of a chore.

When you invoke any command that requires you to select geometric entities, *EasyCAD* and *FastCAD* pop up an entity selection dialog box containing seven buttons: Each, Window, Layer, All, Type, Color, and Same. The Each button lets you select entities one at a time, while Window lets you drag a selection box around the entities you want to select. Layer, Type, and Color let you group-select all the entities on a layer, of a given type (for example, lines or circles), or of a given color. All selects all entities in the drawing, and Same selects the last entity referenced in a command. Once you have finished selecting entities, you are presented with another dialog box that contains the Boolean operators AND, OR, and NOT, which you can use to combine selection criteria. For example, you could use the AND option to specify that only entities of type line and color green are to be included. Then the ensuing operation would only affect green lines. This method of filtering may sound complicated, but in practice it is fast and intuitive.

Both programs performed acceptably on our drawing tests. Setting up a snap grid with a distance of 1 foot between points

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EasyCAD 2
FastCAD
Evolution Computing,
437 S. 48th St., #106,
Tempe, AZ 85281-
9936; 800-874-4028,
602-967-8633.
List Price: *EasyCAD*,
\$199; *FastCAD*, \$795.
Requires: 286-based PC or better, 640K RAM,
hard disk, EGA graphics adapter or better, DOS
2.10 or later, mouse. Math coprocessor recom-
mended for *EasyCAD*, required for *FastCAD*.
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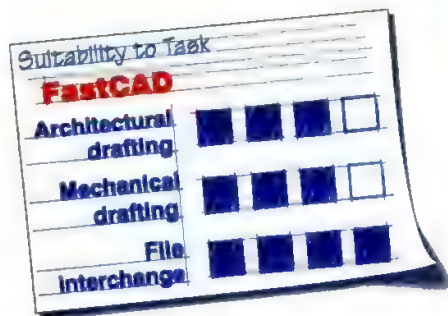


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made laying in the outlines of the walls in the architectural drawing almost too easy, and the trim command did a passable job of cleaning up the intersections. The packages are blindingly fast, so you never have to sit idly by waiting for a screen to redraw, and they are extremely flexible when it comes to handling symbols, making them excellent for jobs that involve the repetitious placement of objects such as windows or door swings in architectural drawings or logic gates in electrical schematics.

You can turn any entity or group of entities into a symbol, and when you modify a symbol definition, all instances of that symbol in the current drawing are modified. Symbols may be scaled and rotated when they are imported into a drawing, but

GRAPHICS LOW-COST 2-D CAD

they must be scaled equally in all dimensions. (By contrast, some packages let you scale the x- and y-axis separately.)

One area where *EasyCAD* could stand some shoring up, particularly if it is to be considered a serious contender in the mechanical engineering market, is hatching. You can pattern-fill an irregular area only by specifying points along its perimeter with the Polygon command. This made it next to impossible to hatch an area in our test drawing that was bound in part by arcs. Also, when filled regions are transported to *AutoCAD* in the form of .DXF files, they are converted to polylines and the hatching information is lost. *FastCAD* is better, but it still makes hatching more of a chore than some of its competitors do. In *FastCAD*, you group the entities that bound the region together into a multipoly, then execute a fill command. There is no direct analog in *EasyCAD*, which does not support multipoly entities.

DIMENSIONING PROS

EasyCAD and *FastCAD* did perhaps the best job of any package in this review of di-

menting the diameters and radii on PC Magazine Labs' piston drawing. When you dimension a diameter or radius in either program, you are given the choice of placing the dimension inside the circle or arc, or outside with a leader pointing in. If you choose the latter method, the first mouse click anchors the leader's elbow, and the second locates the dimension text and the horizontal line that connects it to the elbow. One feature the dimension command lacks is the ability to append tolerances to the dimension text automatically. To add tolerances to the dimensions in the piston drawing, we had to create them as ordinary text.

One of the small wonders that you will find in both packages is the "action" entity—the name *EasyCAD* and *FastCAD* give to rectangular buttons that when pressed execute preprogrammed drawing commands. These are especially useful for conducting live demonstrations or creating animated drawings to illustrate important design concepts. You could, for example, show the landing gear of an airplane folding into the fuselage by drawing the gear in different positions on different layers and writing a script to turn the individual layers

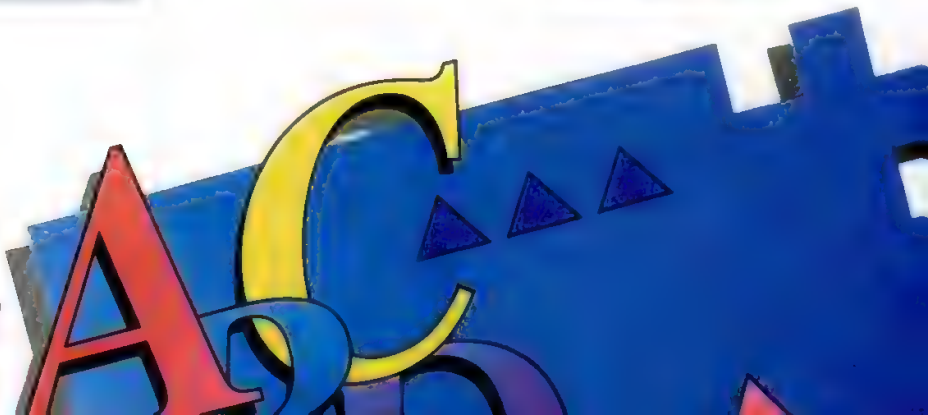
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alternately on and off. Then, by assigning the script to an action button, you could make the plane retract its gear on command.

The drawing files produced by the two packages are binary-compatible, so you can load *FastCAD* drawings into *EasyCAD* without going through an intermediate .DXF translation step, or even load *EasyCAD* drawings into *FastCAD*. This makes the packages an ideal combination for shops that want to provide engineers with a lower-cost version of the software used for production drafting. You may find more-feature-filled CAD programs on the market, but you won't find many that offer a superior combination of ease of use, power, and speed.

Generic CADD, Version 5.0

by Jeff Prorise

You will have to search far and wide to find a 2-D CAD system that is more capable or packs more features than *Generic CADD*, from Autodesk Retail Products, a

GRAPHICS LOW-COST 2-D CAD

subsidiary of Autodesk. Despite its modest price of \$495, it is versatile enough to be both an architect's tool and an aid for drafting engineering drawings. In fact, you would be hard-pressed to find a 2-D application that *Generic CADD* cannot handle adeptly.

In addition to being powerful, *Generic CADD* is easy to use. The first thing you will see when you start the program is a screen with *AutoCAD*-like command menus on the right and a command line and status indicators at the bottom. The remainder of the screen is a viewport into the drawing area. The package is command-driven; you enter a command by selecting



**Generic CADD packs
all the features you will
find in programs that
cost five times more.**

it from the on-screen menu with a mouse or by typing in a two-letter command acronym. When additional input is required, you type in a single letter identifying the desired command option, pick from a menu that pops up at the bottom of the screen, or select a point or other entity in the drawing area.

Generic CADD offers numerous options for adding objects to or subtracting them from a selection set. For example, you can pick objects individually, select all the objects in the drawing or in a particular layer, enclose the desired objects in a window, or pick the last object selected. In addition, you can define selection filters that narrow the range by type of object, layer,

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Dimensioning is fast
and flexible in *Generic
CADD*. Hatching, a
stumbling block for
many under-\$1,000
programs, works
beautifully.

color, line type, or line width. Perhaps more significantly, you can also subtract unwanted objects from the selection set.

A NEST OF COMMANDS

New to Version 5.0 of the package is a nested command structure that lets you execute more than one command at a time. This makes it easy to use one command to modify the operation of another or to perform operations such as pans, snaps, and

zooms after you have begun another procedure. For example, if you place one endpoint of a line and realize that you need to place the other one off the screen, you can type PA (for Pan) after the first endpoint is placed, pan to the desired location, and then place the second endpoint. Snaps work the same way. If you want to snap the endpoint of a line under construction to the midpoint of another, you can type SM (Snap Midpoint) as you move the pointer to the existing line.

Generic CADD's Show by Example feature lets you answer the program's prompts by selecting objects on the screen as well as by the traditional method of typing input. When you are prompted to enter a line color or line type, you can "show" the program what color or type you want by pressing the Equal Sign key (the "Like" key, in *Generic CADD* parlance) and then pointing to an entity that is drawn in the same pattern or color. You can enter virtually any value or property this way, including lengths, distances, sizes, scales, and angles. For example, to duplicate the text height of previously set dimension

text, answer *Generic CADD*'s prompt for the new text height by simply pressing the Equal Sign key, then point to an appropriate dimension. Likewise, the new Match Parameters command permits you to match a whole series of properties (for example, the attributes assigned to dimensions and dimension text) by merely pointing out the entity whose properties you would like to adopt.

The program does not sacrifice power for agility. *Generic CADD* packs all the features you will find in CAD programs that cost up to five times as much. Its more notable features include a Fitted Hatch command for hatching areas defined by objects whose endpoints do not match (most CAD programs require the lines and curves that define a hatch region to come together perfectly at the endpoints); versatile text handling, with eight different fonts to choose from (including one called Architect, which is modeled after an architect's stylized handwriting); and support for symbols and for assigning attributes to those symbols in the form of text. *Generic CADD* also offers macros and script files as a means for automating repetitive tasks.

Generic CADD excelled on PC Magazine Labs' drafting tests. The architectural drawing came together quickly and easily, thanks to a double-line command that draws two lines at once and an intersection trim feature that is second to none. The



FACT FILE
EDITORS' CHOICE

Generic CADD, Version 5.0
Autodesk Retail Products, 11911 North Creek Pkwy. South, Bothell, WA 98011; 206-487-2233.
List Price: \$495.
Requires: 640K RAM, hard disk, DOS 3.0 or later. Math coprocessor, mouse recommended; EMS optional.

In Short: A fast, versatile, easy-to-use CAD package, *Generic CADD* is equally at home drawing floor plans and producing engineering drawings. A big plus is the nested command structure, which allows you to execute multiple commands simultaneously. With the optional .DXF translator (\$99), *Generic CADD* turned in the best results among the packages we reviewed. This is the 2-D CAD product to beat.

CIRCLE 642 ON READER SERVICE CARD

While installing *Point Line Drafter* is simple, you should be aware that you can only install it twice on your computer, due to copy protection.

mechanical drawing proved only a bit more of a challenge. Dimensioning is fast and flexible in *Generic CADD*, although it takes a little time up front to set the dimensioning parameters. Hatching, which is a stumbling block for many under-\$1,000 CAD programs, works beautifully: You just drag a window around the region you want to hatch and *Generic CADD* does the rest.

Generic CADD is no slouch when it comes to speed, either. As the performance tests indicate, you won't spend a lot of time waiting for screens to redraw. If the package isn't fast enough for you, you can speed redraws further by fine-tuning the screen display options in the menus. *Generic CADD* also supports a wide range of input and output devices, including many of the 800-by-600 Super VGA boards currently available. The package does not ship with an 8514/A driver, but you can obtain one free of charge by calling Autodesk Retail Products.

If you want to import and export .DXF files, you'll need *AutoConvert*, which is sold separately for \$99.95. *AutoConvert* performed superbly in the course of testing, providing a higher degree of control over the way translations are handled than any other .DXF conversion routine. This utility lets you edit the default font-conversion table, which determines how .DXF fonts are mapped to *Generic CADD* fonts when you import .DXF files. The next version of *Generic CADD*, expected in the first quarter of 1992, will have .DXF handling built in, as well as the ability to import drawing files in native *AutoCAD* .DWG format.

Autodesk Retail Products also offers more than 30 different symbols libraries, ranging in price from \$24.95 to \$99.95, which you can use to adapt *Generic CADD*

to specific applications, such as producing electrical schematics. The company also offers modules that customize the program for use in home design, surveying, landscaping, and other design-related pursuits. For do-it-yourselfers who are not familiar with CAD but are interested in design by computer, the company offers the Home Series, a set of \$59.95 programs geared for tasks in and around the home such as kitchen and bathroom remodeling.

Whatever your business, you are likely to find something to like about *Generic CADD*. For pure ease of use, power, and speed at a reasonable price, *Generic CADD* is hard to beat.

Point Line Drafter

by Rod Taylor

For power and performance at a competitive price, look to *Point Line Drafter* (\$495), from Point Line Graphics. In addition to the basic drawing tools, this pack-

age includes sophisticated features such as construction lines, specialized text, data management, and an excellent set of architectural and mechanical symbols that make it well suited to most types of drafting.

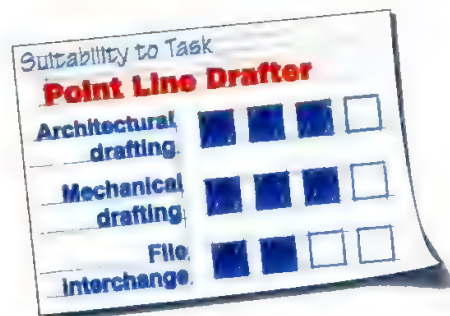
While installing *Point Line Drafter* is simple, you should be aware that you can only install it twice on your computer, due to copy protection. (You can, however, move it from one computer to another using the provided uninstall utility.) Configuring the program is easy, too, but there are some limitations: *Point Line Drafter* runs at a maximum screen resolution of 800 by 600 pixels with 16 colors. The basic package supports only nine video boards and only the Microsoft mouse, which must be installed on COM1. To compensate for these shortcomings, Point Line Graphics sells additional device drivers that support 256 colors at screen resolutions up to 1,024 by 768, and a variety of plotters and digitizer tablets.

Once you are up and working, one feature of *Point Line Drafter* that stands out is its menuing system. The program uses a heads-up display that overlays the command menus onto the drafting screen so that both use the full screen simultaneous-

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ly. Four screen modes give flexible control over the interface: You can display both the drafting geometry and command menus simultaneously, the drafting geometry with a single line prompt, the drafting geometry alone, or the command menu alone.

Point Line Drafter also provides a wide range of commands for measuring features in a drawing, snapping to specific points, or drawing dual-line objects and other graphics entities. Its editing commands comprise the usual tools for trimming, stretching, copying, mirroring, and otherwise manipulating drawing elements. In addition, *Point Line Drafter* lets you use the area outside of the drawing sheet as an electronic scratch pad. You can draw in

GRAPHICS LOW-COST 2-D CAD

this space much as you do in the drawing sheet, but you cannot plot from it.

UP TO THE TEST

Generating PC Magazine Labs' house floor plan and piston detail test drawings was straightforward. In fact, *Point Line Drafter*'s full set of commands for drawing circles, arcs, lines, polygons, text, and dimensions made it easy. Furthermore, *Point Line Drafter* has a full set of construction line-drawing commands that let you sketch dotted construction entities (lines, polygons, circles, and isometric ellipses). It is much easier to lay out complex drawing geometry using construction entities than with point-and-coordinate entry techniques. The construction lines will not plot or print, and you can erase them or toggle them off the drawing display.

While the package is aimed primarily at the architectural market, the associative dimensioning tools offered by *Point Line Drafter* make it useful for creating mechanical drawings as well. These tools include typical linear, angle, diameter, and radius dimension types, as well as baseline

Point Line Drafter lets you use the area outside of the drawing sheet as a scratch pad. You can draw in this space, but can't plot from it.

and chain options. A surprising but welcome dimensioning feature is *Point Line Drafter*'s support for geometric tolerancing symbols.

On our tests, *Point Line Drafter* was awkward in handling text notes, fillets, and pattern fills. You can type in notes or import them as an ASCII file, but they appear as separate lines of text, not as a block. Editing these notes can be quite



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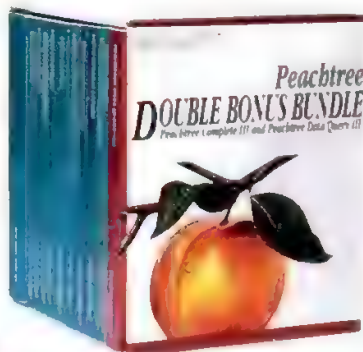
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frustrating, especially since the program does not support a DOS shell on a single-monitor setup.

Creating a fillet or a round is more difficult than it should be. Most CAD systems let you select any two line segments to fillet, but with *Point Line Drafter* you can only fillet line segments that terminate at a common point, and you cannot fillet between lines and curves. In addition, the program offers only limited support for pattern fills and does not include any ANSI-standard material-type patterns. The program also had a hard time filling the cross-sectional view of our piston detail test drawing. We had to execute the fill command twice because of a particular concavity in the perimeter of the view. Furthermore, *Point Line Drafter* cannot generate true area fills. The ones shown in both the floor plan and piston detail test drawings had to be created using closely spaced line segments.

Point Line Drafter does not let you zoom geometry extents, use characters other than alphanumerics in DOS file names, or write command macros (although it is able to execute macros written using *Point Line Professional CADD*).

GRAPHICS LOW-COST 2-D CAD



FACT FILE

Point Line Drafter
Point Line Graphics
Inc., 8383 Greenway
Blvd., Middleton, WI
53562; 608-831-0077.
List Price: \$499.
Requires: 286-based
PC or better, 640K RAM,
10MB hard disk space,
EGA graphics adapter or better, DOS 3.3 or later,
Windows-compatible mouse. Math coprocessor
optional.
In Short: A solid user interface, good dimensioning capabilities, and robust support for architectural and mechanical symbols cannot make up for *Point Line Drafter's* difficulties with text, fillets, and fills. There is a full set of features, but the program makes them unnecessarily difficult to use.



CIRCLE 643 ON READER SERVICE CARD

The program was unable to import the .DXF test file until the file was modified on a text editor to remove the unsupported control characters.

If you are looking for an entry-level 2-D CAD package with a solid user interface, good dimensioning capabilities, and robust architectural and mechanical symbols support, you might want to give *Point Line Drafter* a look. It probably has all the features you need, although you may have a hard time accessing them. Beyond the entry-level market, however, look elsewhere. Having to shell out extra dollars for the device drivers necessary to run the package on higher-powered hardware seems a significant drawback. ■

Jeff Prorise is a contributing editor of PC Magazine and the author of its Tutor column. Jim Boyce is a frequent contributor to PC Magazine. Paul Murphy is a partner in Singer-Murphy Associates, a New Jersey-based land surveying firm, and a frequent contributor to PC Magazine. Jim Ryan is a New York-based free-lance writer and computer consultant. Will Schleiter and Rod Taylor are mechanical engineers based in Knoxville, Tennessee.

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And they weren't just any guys, either.

They were a group of editors from *PC Magazine*, and in their February 26th, 1991 issue, they had some

**BEST WINDOWS 3.0 3270
TERMINAL EMULATOR:
IRMA WORKSTATION FOR
WINDOWS VERSION 1.0.
FEB. 26, 1991.**

awfully nice things to say about DCA's IRMA™ WorkStation for Windows.

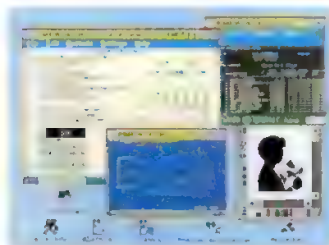
Some comments:

"DCA's product is by far the most flexible that we have tested."

"{IRMA WorkStation for Windows'}

flexibility,
powerful
scripting
language, in-
terface, and asynchronous
abilities make it a top choice."

And, finally, "It's nice to see



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IRMA... out there again as the leader of the pack."



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printer and asynchronous terminal emulations, and an extensive range of 3270 and asynchronous file transfer protocols, including DCA's and IBM®'s.

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change (DDE).

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And after checking out the capabilities of IRMA WorkStation for Windows, we're certain you'll be pretty stuck on our windows yourself.

DCA



DOCUMENT MANAGEMENT SOFTWARE

A Network Under Control



by
Ed Perratore

A company that cannot manage its networked files is a disaster waiting to happen. Document Administrator, PC DOCS, ProFound, and SoftSolution Global help administrators control the creation, access, and revision of documents by users, while keeping current information at the users' fingertips.



Think about this: For an increasing number of large- and medium-size businesses, the total number of documents maintained for ongoing projects at any given time may number more than 100,000, a figure that includes both new files and revised versions of existing ones. Small companies are not immune from the rabbitlike tendencies of documents to multiply—even organizations with as few as three employees can generate their fair share

of multiple-version documents.

Word processing documents probably form the bulk of most of these businesses' files. But depending on the business, users of many non-word processing applications, such as spreadsheets or graphics software, will be creating and editing files as well. Consider also that the multiple-version documents for each individual project may be shared by hundreds of employees across a local area network, or thousands across a wide area network. Somehow, all these files and versions of files must be made both accessible and manageable.

You can begin to see the scope of the challenge.

Law firms (those bastions of *WordPerfect* use) were the first to employ the most comprehensive means of controlling the creation, access, and revision of networked files: document management software. Major contracts and other legal documents, after all, are created word by word and clause by clause; each revision by every staffer must be accounted for (and depending on the company, billed) every step of the way. Document managers make this possible.

Accounting firms, pharmaceutical companies, real estate brokerages, and many other businesses of all sizes have begun to recognize the value of document management software. Billing outside clients is no longer the only question; departments within a company must account for their time, too. Additionally, organizations with a high degree of employee turnover need to minimize the risk of untrained or temporary employees overwriting important files.

REVIEW CRITERIA

In this roundup, *PC Magazine* evaluates four programs to help administrators monitor and users navigate the sea of documents that can exist on a network: Interpreter Software Products' *Document Administrator*, PC DOCS' *PC DOCS*, Wang Informatics Legal and Professional Systems' *ProFound*, and SoftSolutions Technology Corp.'s *SoftSolution Global*. These products range in price from \$295 per workstation for *PC DOCS* to \$995 for a five-workstation version of *ProFound* to \$2,495 for ten concurrent users of *Document Administrator*. *SoftSolution Global*, priced at \$2,495 per server and \$295 per attached workstation, was the costliest product we saw.

Each product considered for this re-

view had to satisfy several criteria. To begin with, each had to support *NetWare*, Version 3.11. Another requirement was that the program had to manage documents created from within any character-based DOS application. For example, they had to be able to launch applications ranging from word processors to spreadsheets, and even integrated packages.

Any could feasibly—however clumsily—invoke an application based in *Microsoft Windows* and load a file, but currently, the document managers' control is inevitably weaker than it will be under upcoming *Windows*-based versions promised from some of the vendors. In addition to the functions they have mas-

tered in the DOS character-based environment, these versions will have to focus on problems pertinent to *Windows*, such as tracking multiple open applications and the files generated by them. Each product also had to provide a way to archive documents.

Finally, we looked only at products that included a built-in front-end interface. One product we did not include in the main review, Saros Corp.'s *Mezzanine*, takes a different approach to document management. It is basically an engine to which users can build or attach their choice of front ends (see the sidebar "Mezzanine: A Different Approach to Document Management").

The programs we reviewed provide a broad array of features for network ad-

HIGHLIGHTS: Document Management Software

■ Document management software helps administrators monitor and users navigate the sea of documents that can exist on a network or even across networks. The software does so with a broad array of functions that includes launching applications and their files, tracking versions of documents, providing text search capabilities, restricting file access to authorized users, and creating reports for billing and other purposes.

■ Document managers are not limited to managing a single application and its related files. Rather, these programs can effectively manage documents created in any character-based DOS application.

■ Although they are application-independent, these products typically feature tighter integration with *WordPerfect* than with any other software (a remnant of the product category's origin in law firm use). For example, most of these packages can intercept several *WordPerfect* keystrokes with tasks of their own. And while these programs may include only ASCII viewers for all other applications, most include a native *WordPerfect* file viewer.

■ Document managers expand the

concept of profile screens. The profile screens of document managers constitute a networked database of indexed records that controls the dozens of versions of documents existing at any given time. A profile screen typically includes fields for entering the name of the document author, the date the document was created, the client, and the subject matter, among other items of information.

■ Most document manager programs implement client/server architecture in some fashion. When a request is made to the Novell Btrieve engine or to the program's proprietary engine, the server processes the request and ships the results to the local workstation.

■ Most of these products offer full-text indexing of documents. While the process can be time-consuming when a large number of pre-existing files must be imported, the feature makes for speedy searches and near-instantaneous retrieval of files.

■ A file's location is irrelevant to users. Document managers, unless otherwise specified by the user, can transparently search across multiple servers on the same LAN or, if they support wide area networks, across servers on diverse networks. ■



Smartcom Exec™, the newest communications software from Hayes, is remarkably easy to operate. In fact, Computer Shopper said "Many people...will be able to install and use the program without

touching a book, because the interface is quite self-explanatory and help is just a function key away."

And yet, Smartcom Exec is also highly advanced. It features everything from the most popular terminal emulations and file transfer protocols to a peruse buffer and a powerful on-line text editor with many word processing capabilities.

Its handy Phone Book data base stores calling information automatically. It has mouse support for point-and-click operation. And its powerful SCOPE™ scripting language lets you write programs for repetitive tasks like unattended

operation and automatic log-ons.

What's more, PC Week said it has the best LAN support of any software they've tested.

All of which is why Smartcom Exec received PC Magazine's prestigious



Editors' Choice Award, Micro Decision's Gold Award, and was named a Buyer's Choice by Computer Reseller News.

At \$129, Smartcom Exec costs much less than you'd expect. And it's even more affordable when purchased in Hayes' unique Multi-Copy software packs.

Call us at 1-800-635-1225 for our product literature which, by the way, we do encourage you to read.

Our technology has the computer world talking. More than ever.



While our software is a best-seller, not many have to read this book.



Smartcom Exec users: Enter the SCOPE contest. \$12,000 in prizes. For details call 1-800-635-1225.

★WideAngle 2.0

(Attitash Software)

Simplify DOS-to-Windows migration. Eliminate desktop clutter. WideAngle expands desktop to nine screen-sized workspaces. Spread applications out into workspaces...each only a click or hot key away. XRAY View "sees through" Windows clutter to find hidden apps/icons. Customize hotkeys, auto-launch groups, and workspaces. **UT1754 \$65.**



★OnTime for Windows

(Campbell Services, Inc.) OnTime for Windows is an easy to use, lifetime calendar and to-do list manager that takes full advantage of the Windows 3.0 environment. Features include: attractive calendar printouts including a tri-fold, week and month-at-a-glance graphic displays, automatic projection of recurrent records, to-do items that roll over until you mark them done and more. **BS3584 \$75.**

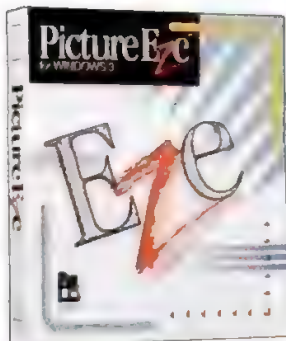
★PackRat 4.0

(Polaris) PackRat is a powerful information manager indispensable for the busy executive. PackRat makes it a snap to manage business and personal information of all types-names, phone numbers, meetings, to-do lists, notes and much more. Exchange information with Word for Windows or Ami Pro. Awarded PC Magazine's "Editor's Choice" and "Best of 1990." **BS2894 \$259.**



★PictureEze 1.0

(Application Techniques, Inc.) PictureEze, a graphics file converter for Windows 3.0, supports a variety of different input file formats. Converts images into the correct file format your application requires. Features flexible output file types, superior image modification, flexible color enhancements, quick results and repeat operations to convert a series of images. **GR2134 \$95.**



★CorelDRAW! 2.0

(Corel Systems) CorelDRAW! is the award winning PC graphics software that gives you incredible type control and superb drawing power in a value-packed program. Now, CorelDRAW! 2.0 comes with more drawing power and over 150 fonts; over 3,500 clip art images and symbols; 31 import/export filters; an autobrace utility, a font conversion program and Mosaic, a visual file manager. **GR0543/5 \$369.**



★After Dark for Windows

(Berkeley Systems) After Dark for Windows prevents screen burn-in with over 35 fantastic displays and has two-level password protection. Use flying toasters or a logo as screen saving art, type in messages or set up a slide show style presentation. The SystemIQ task manager maximizes performance while running After Dark. **GR1994 \$29.**



★M.Y.O.B. for Windows

(Teleware) Incredible Accounting Software for Windows. M.Y.O.B. contains full-featured General Ledger, Accounts Receivable and Payable, Inventory and Card file. In addition to running your business more efficiently, M.Y.O.B. even helps you organize your time using its business calendar and to do list. The hottest selling program for the Macintosh is now available for PC Users. Don't pay a penny more! **FN0414 \$135.**



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CP0100	N3/SX Notebook 40MB 2195.
Sharp	
CP0080	Wizard OZ 8200 399
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EX1470	EtherMale Trio16 255.
InfoChip Systems	
EX1640	Expanz Plus Expander Card 95.
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EX1110	Co-Processor 80387SX 125.
EX0180	Co-Processor 80387-20 209
Media Vision	
EX1580	ProAudio Spectrum 259.
Stac Electronics	
EX1480	Stacker 99.
EX1490	Stacker Co-Processor 149.

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AC2920	Command Center 85
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Kensington

AC3740	Laser Stand 152.
AC0140	Masterpiece Plus 95.
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AC2340	Premier Leather Case 169.
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AC0670	Universal Notebook Case 66.
Upsonic	
AC3800	PC Might 25 149.

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HyperGlot

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Iomega

DR0600	5 25" 44Mb Storage Cartridge 83.
DR0560	Bernoulli Box II 44Mb Int. 789.
DR1970	Bernoulli 90MB Transportable 799.

MicroSolutions

DR1790	backpack 2 8Mb 229.
DR2080	Qic 80 Tape Drive 449.

Optical Access International

CD0180	CM 50 Portable CD-ROM 399.
BN0040	CM 50 Port. CD-ROM/CorelDRAW. 799.

Plus Development

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PR1750	NP80-24E Printer 315.
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Nisca

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MT0070	Multisync 3D	625
MT0060	Multisync GS2A	229

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MT0280	PanaSync C1381 14" VGA Color	369
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EN2014	Lottery Tracker & Wheeler 4.0	29
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EN1473/5	★ Entertainment Pack	27
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BS1844	PC USA 2.0	35

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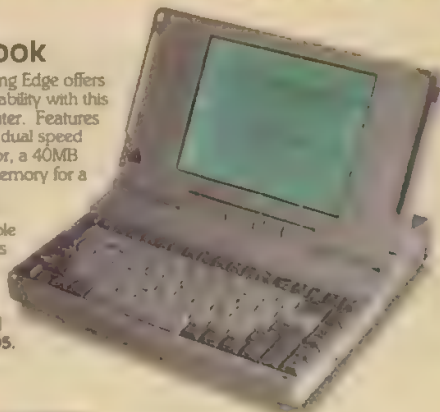
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ED2323	★ Excel Beginning Spreadsheets	49
ED2363	★ Excel Business Graphs	59
ED2333	★ Excel Intermediate Spreadsheets	59
ED2373	★ Excel Macros	59
ED2353	★ Excel Powerful Spreadsheets	59
ED2423	★ PageMaker Beginning	49
ED2273	★ PageMaker Intermediate	59
ED2283	★ PageMaker Tips and Techniques	49
ED2243	★ Windows 3.0 Getting Started	49

★MicroCourier

(Microcom) With MicroCourier, new from Microcom, Windows communications software is now available for under \$100. Use MicroCourier to connect with other PCs, bulletin boards, and information services. MicroCourier offers a full range of Windows features. It also supports all the popular terminal emulations and file transfer protocols. **CM0564 \$65**

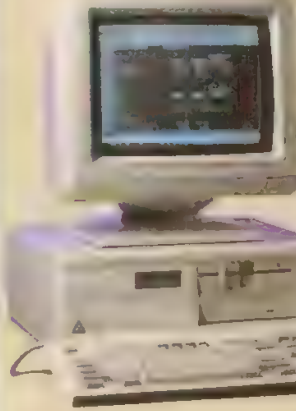
N3/SX Notebook

(Leading Edge) The Leading Edge offers you convenience and portability with this compact notebook computer. Features include a powerful 386SX dual speed 16-20 MHz microprocessor, a 40MB hard drive, and enough memory for a variety of jobs including spreadsheet and graphical applications. A rechargeable battery gives you 2.5 hours of computing time. Whether you're in the office or on the go, the N3/SX Notebook meets all your needs. **CP0100 \$2195.**



Leading Edge Model D3/SX

(Leading Edge) Combined power of 32-bit processing and the economy of 16-bit ISA peripherals gives you compatibility with all current software and future 32-bit software. Features include 40MB hard drive, 3.5" and 5 25" floppy drives; 2MB of RAM expandable to 4MB on the motherboard with a maximum system configuration of 16MB, 101-key keyboard, Super VGA 1024x768 analog/TTL video controller and 14" color monitor; mouse port and mouse; two 25-pin serial ports and one parallel port; MS-DOS and Basic; Microsoft Windows 3.0; 2-year warranty. **BN0090 \$1495.**



KX-P1124i

(Panasonic) Announcing the Panasonic KX-P1124i printer, a high speed 24-pin printer with the high end printer features you need. Control all of your printing features, save and recall them for up to four different applications using the EZ Set operator panel. Other features include: a wide variety of paper handling capabilities as rear, bottom, front and top paper feed paths and a push/pull tractor. Excellent print quality with 11 resident fonts in ten different sizes and 360 x 360 dpi resolution. Includes a two-year limited parts and labor warranty. **PR2200 \$299.**



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CIRCLE 225 ON READER SERVICE CARD

★Marstek Color Artist Hand Scanner for Windows 3.0

(Marstek) Scan up to 262,144 colors or 64 shades of gray. Switch to half-tone mode for line art or OCR. Includes the interface card, Picture Publisher 3.0 editing software and Perceive Personal OCR software. **IN2310 \$489.**



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★ Presentation Task Force

(New Vision Technologies) Clip art for those who mean business. Presentation Task Force contains 1,100 vector graphics in the popular CGM format, making it compatible with most PC charting, drawing and word processing programs. The collection has been designed for business, health care and military professionals, and is suitable for all types of color and black and white printers. **GR0823/5 \$134.**



Hijaak Release 2.1

(Inset Systems) Hijaak 2.1 is a graphics conversion and screen capture utility, and translates more than 43 graphics file formats such as GEM, PICT 1&II, CGM, DRW, HPGL, PIC, DXF, PCX, MAC, TIF, and supports more than 25 group 3 fax devices. 5K pop-up for capture function of both text and graphics screen, including Windows 3.0 screens. **UT1614 \$99.**



Spinrite II 2.0

(Gibson) Spinrite II 2.0 identifies, diagnoses and repairs every form of data and low-level format damage on standard DOS hard disks. Eliminates common DOS errors and optimizes system's sector interleaving to deliver optimum hard disk data transfer rates. Detects disk surface flaws, moves endangered data to safety and much more. **UT0874 \$65.**

★ WINFAX PRO 2.0

(Delrina) WINFAX PRO is a state-of-the-art Windows send and receive fax system for your PC. Send quality faxes from any Windows application to a fax machine or another PC. Sends and receives faxes in the background. Schedule faxes and merge ASCII files into the phone book. Requires Windows 3.0 and a compatible fax modem. **FX0154 \$75.**



ACTI 2.1

(Contact) ACTI, the best-selling contact manager, is a powerful yet easy to use PC-based program that provides the database, scheduling and word processing functions most needed to organize the day-to-day activity of business people. ACTI is now available in Single-User **BS1064 \$225**, Network Server Plus One **BS3504 \$355** and 5-User network versions **BS3514 \$799.**



386MAX 6.0 and BlueMAX 6.0

(Qualitas) Qualitas' new memory managers feature SmartMemory™, Automatic Reordering, an integrated graphical interface, disk cache, and system analyzer to give you more memory and better performance than any other memory manager. 386MAX 6.0 also features ROMsearch™ and VGAswap™. BlueMAX 6.0 features BIOS Compression technology for IBM PS/2s. **386MAX 6.0 UT0683/5 \$67.** **BlueMAX 6.0 UT1673 \$79.**



★ WordScan +

(Calera) WordScan +, designed for Windows 3.0, provides the most accurate, feature-rich omnifont OCR on the market. Saving you the time of retyping, WordScan automatically converts both scanned documents and fax file images into word processing, database, spreadsheet, and desktop publishing applications. Features include deferred processing, image previewer, verifier, plus built-in and user modifiable dictionaries. **GR2114 \$699.**

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GR2134	★ PictureEze 1.0	95
BS0204	★ Pizazz Plus 2.0	65.
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	★ Image Portfolio (various)	85.
Atech		
GR2763/5	★ Pub. Powerpak for Windows	55.
GR2773/5	★ Pub. Powerpak for WordPerfect	55.
Berkeley Systems		
GR1994	★ After Dark for Windows	29
Broderbund		
GR1564	★ New Printshop	35
GR0064	★ New Printshop Companion	29
Caera Corporation		
GR1984	★ Omnipage 386 3.0	479.
Calera		
GR2114	★ WordScan+	669
Computer Associates Int'l		
GR1823	★ CA Cricket Graph 1.3	85.
Corel Systems		
GR0543/5	★ CorelDRAW! 2.0	369.
Custom Applications		
GR1945	★ Freedom of Press Light 2.5	55.
hDC Computer Corp.		
BS3114	★ Icon Designer	35.
Icom Simulations		
GR1854	★ Intermession	32.
Micrografix		
GR1773/5	★ Charisma	344.
GR2783/5	★ Designer 3.1	485.
Micrologic		
GR1444	★ MoreFonts 2.0	79.
Microsoft		
BS2304	★ Powerpoint for Windows	315
GR2830	★ Microsoft Publisher for Windows	129
New Visions Technology		
GR0823/5	★ Presentation Task Force	134
Power Up Software		
GR0884	★ Express Publisher 2.0	99.
Software Publishing		
GR2303/5	★ Harvard Graphics 3.0	415.
Timeworks		
GR2334	★ Publish-It! 2.0	135.
WordPerfect		
GR1194	★ DrawPerfect 1.1	269
Xerox		
GR1574	★ Ventura Pub. Gold 3.0 (Win.)	559
ZSoft		
GR0634	★ PC Paintbrush IV Plus	119
GR2024	★ Publisher's Paintbrush 2.0	299

CAD PRODUCTS

American Small Business Co.		
CA023/5	★ Design CAD 3D 3.1	189
CA0203	★ Design CAD 5.0	249

AutoDesk		
CA0173/5	★ AutoSketch 3.0	146.
Computer Easy		
CA0153/5	★ Dream House Professional	47.
Foresight Resources		
CA0124	★ Drafix CAD for Windows 3.0	435.
Generic Software		
CA0074	★ Generic CADD 5.0	285.
IMSI, Inc.		
GR2384	★ TurboCAD Release 2	89.
MathSoft		
CA0193/5	★ MathCAD 3.0	315.

BUSINESS

Abacus		
UT1684	★ Becker Tools 2.0	76.
Absolute Solutions		
FN0283/5	★ Computerized Classic Accounting	169.
FN0553/5	★ Evolve	129.
AddStor		
UT2194	★ SuperStor	85.
Alpha Software		
BS2164	★ Alpha Four	309
Artworx		
BS4094	★ Graftek	85.
Ashton Tate		
BS0773/5	★ dBASE IV 1.1	485.
Attitash Software		
UT1754	★ WideAngle 2.0	65.
AutoMap, Inc.		
BS5224	★ AutoMap	59.
Avery		
GR0804	★ Label Pro Laser	45.
Borland International		
BS0214	★ Paradox 3.5	519.
BS3044	★ Quattro Pro 3.0	319
Brown-Wagh		
FN0424	★ Service Industry Accounting	295.
Buttonware		
BS5134	★ PC File 6.0	85.
Campbell Services, Inc.		
BS3584	★ OnTime for Windows	75.
Career Design Software		
BS4034	★ Career Design	59.
Central Point Software		
UT2064	★ Central Point Anti-Virus	79.
UT2133	★ PC Tools 7.0	109.
Chipaoft		
	★ Turbo Tax for DOS Personal/1040	Call
Chronologic Corp.		
UT0584	★ Instant Recall	62.
Contact Software Int'l		
BS1064	★ ACT! 2.1	225
BS3514	★ 5-User Network Version	799
BS3504	★ Network Server Plus One	355.
DacEasy Inc.		
FN0014	★ Dac Easy Accounting 4.1	85.
FN0024	★ Dac Easy Bonus Pak 4.1	129.
Darlan Technology		
UT1904	★ System Sleuth Pro 3.0	85.
UT1704	★ Win Sleuth 1.0	85.
Datasmart Tech.		
CM0424	★ PROCOMM PLUS 2.01	65.
DCA/Crosstalk Communications		
CM0284	★ Crosstalk Communicator	59
CM0194	★ Crosstalk for Windows 1.2	129.
Davidson & Associates		
EN0024	★ Monologue	99.
Delrina Technology		
BS0853/5	★ PerFORM Designer & Filler 2.1	90.
BS2604	★ PerFORM PRO	149.
FX0154	★ WinFax Pro 2.0	75.

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BS3543/5 IdeaFisher 3.1 399
BS3574 Strategic Planning Plug-In Module 65.

Fifth Generation

UT0724 Direct Access 5.1 62.

Fox Software

BS0705 Foxbase + Dev. System 2.10 189.

BS4065 FoxPro 2.0 479.

GeoWorks

OP0064 GeoWorks Ensemble 125.

Gibson Research

UT0874 Spinrite II 2.0 65.

Great American Software

FN0264 Money Matters 51.

FN0215 One-Write Plus Acct. System 189.

hDC Computer Corp.

UT1944 ★ FileApps 75.

UT1634 ★ FirstApps 55.

UT0644 ★ Windows Express 3.0 55.

Helix

BS3154 ★ NetRoom Single User 2.0 49.

Hewlett-Packard

BS2783/5 ★ New Wave 3.0 for Windows 109.

Infinity Software

BS5364 ★ Winvoice 165.

Inset Systems

UT1614 Hijaak 2.1 99.

Intuit

FN0164 Quicken 5.0 37.

Quicken for Windows 45.

Lotus

BS0344 Agenda 1.01 49.

BS3174 Agenda 2.0 288.

GR0864 Ami Pro 1.2 299.

BS4073/5 Lotus 1-2-3 Rel. 2.3 339.

BS2433/5 ★ Lotus 1-2-3 Rel. 3.1 405.

BS5253/5 ★ Lotus 1-2-3 for Windows 399.

BS3973 Lotus Graph Writer II 335.

BS2654 Lotus Works 1.0 95.

BS2323/5 Symphony 2.2 515.

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UT0844 AutoMenu 4.7 38.

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BS5164 The Daily Plan-It! 65.

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UT0563/5 LaserTwin All-in-One 115.

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UT1804 ★ File F/X 75.

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CM0084 Carbon Copy Plus 6.0 115.

CM0564 ★ Micro Courier 65.

UT0894 Virex PC 78.

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BS5124 InfoSelect 2.0 89.

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CM0503/5 ★ Close-Up 4.0 (Windows & DOS) 119.

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Okna Corporation

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FN0233/5 Peachtree Complete III 5.0 145.

FN0253/5 Peachtree Cmpl. III Bonus Bdle 215.

Polaris

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BS2934 ★ PackRat 4.0 for Networks 429.

Precision Software

BS1874 ★ Superbase 4 Windows 410.



Prisma Software

UT1044 ★ Your Way 129.

QMS

BS1624 ★ Ultrascript PC Plus 2.1 279.

Qualitas

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UT1673 BlueMax 6.0 79.

Quarterdeck Office System

BS0163/5 DESQview 2.4 79.

BS1043/5 DESQview 386 2.3 129.

EX1103/5 ★ QEMM 386 6.0 61.

Que Software

WP0544 RightWriter 4.0 52.

Reality Technologies

FN0124 Wealthbuilder 1.1 95.

FN0334 WealthStarter 1.0 35.

Reference Software

WP0334 Grammatik IV 2.0 55.

WP0514 ★ Grammatik Windows 55.

SitBack Technologies

BS3554 ★ SitBack for Windows 79.

Softlogic Solutions

UT0073/5 Disk Opt.m. Tools w/ Data Guard. 35.

Software Directions

UT1914 PrintO 5.0 85.

UT0884 PrintO LAN 285.

Software Publishing

WP0463/5 Professional Write 2.2 160.

WP1523/5 ★ Professional Write Plus 165.

Software Ventures Corp.

CM0524 ★ MicroPhone II 2.0 for Windows 205.

Spinnaker Software

BS1923/5 BetterWorking Eight-In-One 32.

BS3604 ★ PFS Windows Works 125.

BS1134 The Resume Kit 29.

Symantec

WP1573/5 ★ Just Write 1.0 129.

UT2154 Norton AntiVirus 1.5 85.

UT2183 ★ Norton Desktop for Windows 99.

UT0054 Norton Util. Advanced 6.0 115.

UT2153 ★ Norton Backup Windows/DOS 85.

BS4013/5 Q&A 4.0 255.

BS3723/5 ★ On Target 1.0 255.

Teleware

FN0414 ★ M.Y.O.B. 135.

Timeslips Corp.

BS0133/5 Timeslips III 4.0 189.

Touchstone

UT0734 Check It! 3.0 85.

Traveling Software

UT0394 Laptop III 89.

UT2014 ★ WinConnect 1.0 65.

Vertisoft

UT0904 Double Disk 62.

WordPerfect Corp.

WP0363/5 WordPerfect 5.1 249.

WP0504 LetterPerfect 1.0 129.

WordScience

WP0483/5 Definitions Plus 65.

WordStar U.S.A.

WP1604 ★ Correct Grammar for Windows 59.

WP1614 ★ WordStar for Windows 279.

XTree Company

BS3243/5 VmSafe 4.5 55.

UT1874 XTree Gold 2.0 92.

LANGUAGES

Asymetrix

LN1454 ★ Toolkit 289.

Borland International

LN1654 Borland C++ 2.0 Prof. 329.

LN1664 ★ Object Vision for Windows 95.

LN0443/5 ★ Turbo Pascal for Windows 129.

Microsoft

LN0074 C Compiler 6.0 315.

LN0043/5 QuicC 2.5 65.

LN1674 Visual Basic 129.

Nantucket

LN1444 Chipper 5.1 510.

Solution Systems

LN0433/5 Brief 3.1 for DOS 179.

Spinnaker Software

LN1464 ★ Spinnaker Plus 269.

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ministrator and user alike; among other abilities, they can track versions of documents, restrict file access to authorized users (with more or less effectiveness), create reports for billing and other purposes, and provide text search capabilities for wading through stacks of documents. We excluded an array of products—among them text managers such as *Folio Views* and *ZyIndex* and file managers such as *XTree Gold*—that in

one or more ways overlap with the definition of document managers but never provide their breadth of functionality. (For more information on these products, see the sidebar “Not Quite Document Managers: A Breakdown of Overlapping Product Categories.”)

Though it was not a criterion, all products except *Document Administrator*

provide full wide-area network support, at least for Novell's *NetWare*. With WAN support, users can transparently create profiles for, search, archive, control access to, and otherwise manage documents on networks connected via wide-area links.

Intel (503-629-7054) markets *ReferencePoint* (\$495 for a five-user license), a document management package formerly owned by LANSystems. We did not review it because a major new release of the



EDITORS' CHOICE

■ PC DOCS

Of the four document management packages we reviewed, *PC DOCS* from PC DOCS displayed the best blend of functionality, ease of use, speed, and security. In view of the importance of security in the document management arena, *PC DOCS*'s performance in that category alone would likely be enough to earn it the Editors' Choice. After all, one of the main reasons for buying a document management system is to track the different versions of documents that exist on a network. You cannot do that effectively if you cannot monitor all the files that users open, create, and revise.

PC DOCS does not prevent users from exiting to DOS in most of the applications it launches (*WordPerfect* is the exception). But unlike other products, *PC DOCS* does not let users exit and browse through files, revise them, or create new ones without *PC DOCS* knowing about it. The secret lies in a 26K TSR that can track all DOS file manipulations. Sure, 26K is a little hefty for a TSR, but this technique is the most effective one we saw. Chances are that most document management users will work in word processors rather than in memory-intensive applications. (*SoftSolution Global* runs a close second in this arena. You can program it to prevent users from exiting to DOS, but unlike *PC DOCS*, the software will not catch documents created under an application's second window.)

Additionally, *PC DOCS* boasts one of the more complete activity

logs we saw. While *Document Administrator* lacks any type of activity logging and *SoftSolution* makes some half-hearted attempts at it, *PC DOCS* logs document copies, accesses, viewings, actual editing times, and more. While all the products could improve on logging such things as system accesses and tasks performed in the system, *PC DOCS* moves a step beyond the competition by tracking all failed attempts to retrieve a file.

Given the complexity of these products, network administrators will appreciate the pains *PC DOCS* took to make its software easy and accessible. All of these products provide the administrator or systems integrator with a wealth of options. *PC DOCS* eases the burden of choice by making smart decisions about configuration defaults that show not only a good knowledge of the field but also attention to the customers' needs. The current product is limited to *NetWare* networks, but it makes installation easier by importing information about users directly from the Novell bindery. It also allows the administrator to import user information from ASCII files, unlike some other products. Data can be imported to profile fields from comma-delimited files or even from within ASCII or *WordPerfect* files. (The program's tight integration with *WordPerfect* in many areas is common to most of the products we reviewed.) Users will find the product easy to navigate: They can conduct searches on almost any

combination of profile fields, either by filling in the blanks or by choosing from validation tables.

On our informal tests, the product's proprietary full-text indexing engine zipped through our test-bed. It imported and indexed our 1,500 test documents in a remarkably quick 2 hours. By contrast, *SoftSolution* took more than 50 percent longer than *PC DOCS* did, and *Document Administrator* took over 24 hours.

PC DOCS could do some things better. It could offer the administrator the ability to create additional profile fields. It could include the range of native file viewers that *Document Administrator* boasts. It could avoid the loss of original documents by requiring users to create new versions of files they change, a feature provided by *ProFound* and *Document Administrator*, and even by *SoftSolution* if you program it through its API. Additionally, all of the products could use better documentation. Users of even the well-designed *PC DOCS* will benefit from on-site instruction or classroom training.

At \$295 per workstation for the full-text-indexing version of the program, *PC DOCS* can work out to be somewhat more expensive than its competitors for larger installations. But the solid design of this document manager easily justifies the extra investment. *PC DOCS* offers the greatest combination of convenience, performance, and security across both local and wide area networks.

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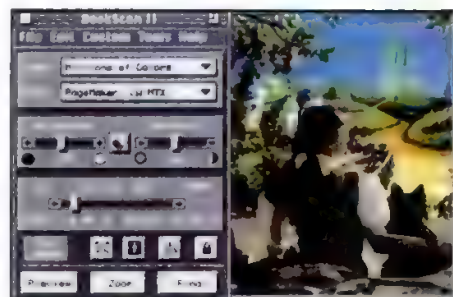


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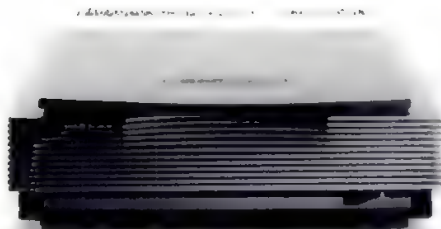
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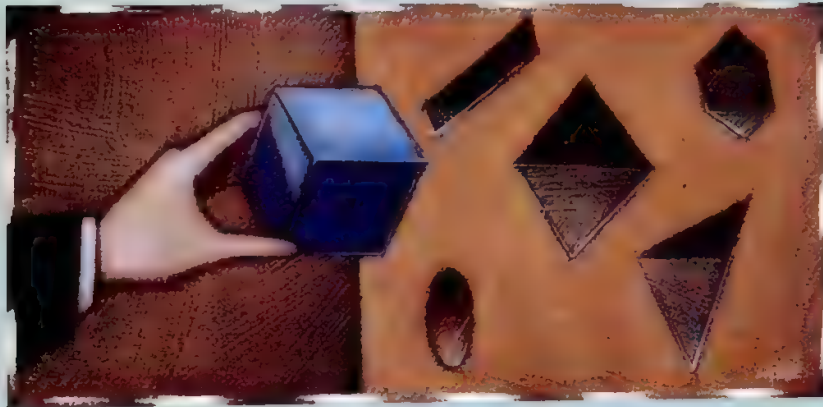
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NOT QUITE DOCUMENT MANAGERS: A Breakdown of Overlapping Product Categories



by Ed Perratore

File managers, text managers, document managers. It's easy to be confused by the labels that software vendors and the computer media use to classify products that overlap in functionality. Vendors whose products fit neatly into categories are elated; it makes their marketing challenge much easier. The others? Let's say document management software vendors have their work cut out for them when marketing to new prospects—at least outside the legal markets from which their products evolved.

Because the technology behind document management is still new to many businesses, our evaluations of *Document Administrator*, *PC DOCS*, *ProFound*, and *SoftSolution Global* have addressed what document management *is*. Here, for comparison, we run down the product niches that share some features with document management but define what document management is not.

Text management In general, document managers allow indexed searches with the basic Boolean operators plus wildcards and several levels of nesting. More-advanced techniques are slow in coming.

Text managers, however, concentrate on the search and linkage possibilities of standalone or networked files, depending on the product. (These files

may or may not be word processing files.) Hypertext packages such as Folio Corp.'s \$495 *Folio VIEWS* or Ntergaid's \$395 *HyperWriter* ("3-D Reading with the Hypertext Edge," *PC Magazine*, May 28, 1991) let you link related information among files. Working with files independent of the format or source application, these "authoring" products include some word processing functionality. Like most document managers, they also let you index text.

Related text search and retrieval products include Lotus's notable \$139 *Magellan* and the \$395 *askSam* from askSam Systems. *Magellan*'s features include the ability to search for text strings across networked files of any nongraphics format, including compressed formats. You can view and scroll the results of your searches through an included, extensive set of native file viewers. *askSam*, Access Softek's Windows-based combination of the \$144.95 *Dragnet* and the \$129.95 *Prompt*, TextWare Corp.'s \$495.00 single-user version of *TextWare*, Zylab's \$395.00 single-user version of *ZyIndex for DOS* or *ZyIndex for Windows*, and the rest of a diverse group of text retrieval packages let you add searchable fields to your text (a feature shared by *SoftSolution Global*). Some text management products also allow proximity searching and application launching.

Many packages, however, require modification of files' existing structures for importation. Document managers import files for creating profiles and (usually) for indexing. All modifications to a file, except by redliners and grammar checkers you may launch, remain the sole task of the application that created the file. Text managers do not typically offer version or audit control, real network support, security, individual user configurations, reports, or document profiles.

Organizations often do not choose between text retrieval and document management but rather combine the strengths of both. A company may already have a *Folio Views* or *ZyIndex* infobase in place when it integrates a document manager into the network. Even if it does not, the company may wish to use the document management system (a dynamic database of files) to update the text retrieval program's otherwise static infobase. It can then carry out file linking and advanced searches on the infobase.

File management A much farther cry from document managers than text management packages are, the DOS shells falling into the file management category are nevertheless confused with document managers as well as with text retrieval packages.

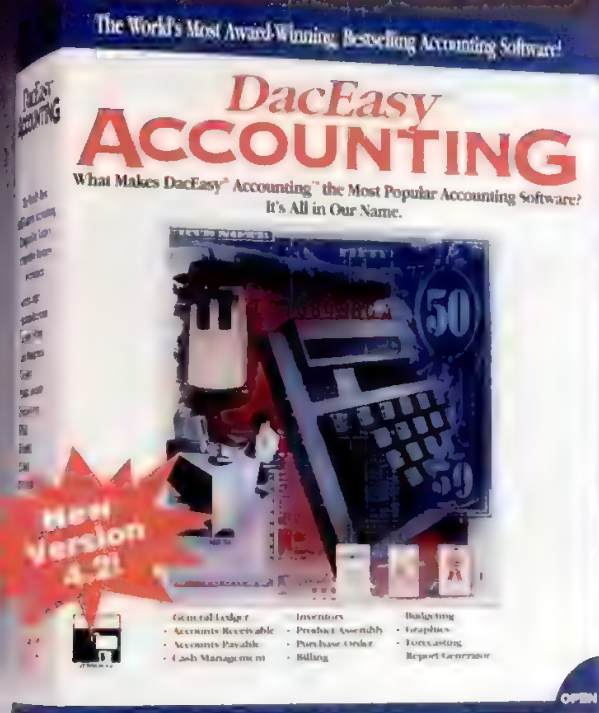
Programs such as the \$99.95 *Q-DOS 3*, the \$89.95 *Tree86*, or the \$149.00 *XTree Gold* will display a disk's directory structure (networked as well as standalone), the files within each directory, and information such as time and file size. You can also launch an application, perhaps feeding it a filename to load, and perform a variety of other functions that for the most part extend DOS's capabilities.

Document managers address a market nowhere near that of file managers. (Of course, this does not keep people from asking vendors to explain the difference.) File managers perform block operations on files surpassing anything that other types of applications, including document managers, can match, or wish to match. But they

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CIRCLE 502 ON READER SERVICE CARD

NOT QUITE DOCUMENT MANAGERS

CONTINUES

lack the document management functions also absent in text retrieval products. Searches by file management programs also cover only a particular drive or directory—not an entire local or wide area network.

Statistical reporting The packages in this category are not generally lumped in with document managers, largely because they form a class of their own. Yet a few of their features are found in the document managers we reviewed ("Statistical Reporting Software," *PC Magazine*, October 30, 1990).

Statistical reporting products such as Cheyenne Software's \$895 *Monitrix* and Network General's *Watchdog Network Monitor* (\$1,995 for Ethernet, \$2,695 for Token-Ring) provide much more than the user reporting available in document managers. They give a complete picture of network usage, categorized by user, specified workgroup, or both—even providing detail like the time logged on to the network or spent within an application.

Other features include reporting on file-server disk cache and hard disk load status, and automatically logging off users after specified periods of inactivity.

The combinations of features in this product category actually have little to do with document management's primary focus of controlling the creation, access, and modification of LAN- or WAN-based files. But when document-manager vendors tackle system access with these abilities to monitor and report on document access, they can look to statistical reporting software to see how it's done.

askSam, Version 5.0

askSam Systems, 119 S. Washington, Perry, FL 32347; 800-800-1997, 904-584-6590.

List Price: \$395.00.

Requires: 384K RAM, DOS 2.0 or later.

CIRCLE 422 ON READER SERVICE CARD

Dragnet, Version 2.1b

Prompt, Version 2.0b

Access Softek, 2550 9th St., #206, Berkeley, CA 94701; 415-848-0606.

List Price: *Dragnet*, \$144.95; *Prompt*, \$129.95.

Requires: 80K RAM (*Dragnet*), 90K RAM (*Prompt*); *Microsoft Windows 3.0* or later; mouse (*Prompt*).

CIRCLE 423 ON READER SERVICE CARD

Folio Views, Version 2.1

Folio Corp., 2155 N. Freedom Blvd., #150, Provo, UT 84604; 800-543-6546, 801-375-3700.

List Price: \$695.00.

Requires: 512K RAM, hard disk, DOS 3.0 or later.

CIRCLE 424 ON READER SERVICE CARD

HyperWriter, Version 2.5

Ntergaid Inc., 2490 Blackrock Turnpike, #337, Fairfield, CT 06430; 203-368-0632.

List Price: \$395.00.

Requires: 384K RAM, DOS 3.0 or later.

CIRCLE 425 ON READER SERVICE CARD

Magellan, Version 2.0

Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-635-6887, 617-577-8500.

List Price: \$139.00.

Requires: 512K RAM, 10MB hard disk, DOS 2.1 or later.

CIRCLE 426 ON READER SERVICE CARD

Monitrix, Version 2.1

Cheyenne Software Inc., 55 Bryant Ave., Roslyn, NY 11576; 800-243-9462, 516-484-5110.

List Price: \$895.00.

Requires: **Server:** 64K RAM, 40K hard disk space, *NetWare 2.1* or later. **Workstation:** 512K RAM, DOS 3.0 or later.

CIRCLE 427 ON READER SERVICE CARD

Q-DOS 3, Version 1.5

Gazelle Systems Inc., 305 N. 500 West, Provo, UT 84601; 800-786-3278, 801-377-1288.

List Price: \$99.95.

Requires: 384K RAM, DOS 2.0 or later. Hard disk recommended.

CIRCLE 428 ON READER SERVICE CARD

TextWare, Version 3.0

TextWare Corp., P.O. Box 3267, 347 Main St., Park City, UT 84060; 801-645-9600.

List Price: Single-user version, \$495.00; with imaging capability, \$745.00. NetBIOS versions, \$995.00 to \$4,995.00.

Requires: 400K RAM, hard disk, DOS 3.0 or later.

CIRCLE 429 ON READER SERVICE CARD

Tree86, Version 3.21

The Aldridge Co., 2500 City W. Blvd., #575, Houston, TX 77042; 800-548-5019, 713-953-1940.

List Price: \$89.95.

Requires: DOS 2.0 or later, 200K RAM. Hard disk recommended, mouse optional.

CIRCLE 432 ON READER SERVICE CARD

Watchdog Network Monitor, Version 1.0

Network General Corp., 4200 Bohannon Dr., Menlo Park, CA 94025; 415-688-2700.

List Price: Ethernet version, \$1,995.00; Token-Ring version, \$2,695.00.

Requires: Workstation: 286-based PC or better, 640K RAM, DOS 3.1 or later. 20MB hard disk recommended.

CIRCLE 433 ON READER SERVICE CARD

XTree Gold, Version 2.5

XTree Co., 4330 Santa Fe Road, San Luis Obispo, CA 93401; 805-541-0604.

List Price: \$149.00.

Requires: 256K RAM, DOS 3.1 or later.

CIRCLE 444 ON READER SERVICE CARD

ZyIndex for DOS, Version 3.1

ZyIndex for Windows, Version 4.02

ZyLAB Corp., 100 Lexington Dr., Buffalo Grove, IL 60089; 800-544-6339, 708-459-8000.

List Price: Either product: Single-user version, \$395.00; additional workstations, \$195.00; five-workstation LAN pack, \$995.00.

Requires: 448K RAM, DOS 2.0 or later.

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CIRCLE 226 ON READER SERVICE CARD

CONNECTIVITY DOCUMENT MANAGEMENT

product was not ready in time for testing. The current release, Version 1.8, however, provides application-independent operation across *LAN Manager*, *NetWare*, and *VINES* networks, and offers version control and security features similar to those found in the products reviewed. Both it and the upcoming Version 2.0 lack true wide-area network support. But the new version, which should be out by the time you read this, adds full-text indexing.

ORIGIN OF THE BREED

Among the most influential roots of document management packages are the mini-computer-based time/billing accounting programs written and sold by consulting firms in the late 1970s. Of these firms, the survivors of the PC revolution in the early 1980s are the vendors whose products appear here.

These products expand upon a concept that has long been a feature of some word processors: profiles. In their most basic form, these packages are screens in which you enter information pertinent to the document. Two of today's heavy-hitting corporate word processors, *Microsoft*

Word and *WordPerfect*, let you type information into profile screens and perform limited file searches on them with fields such as document name, author, and keywords. While offices that use those programs and have very limited management needs may choose to settle for their profiling capabilities, word processors such as these lack many features that are characteristic of document managers, such as real version control across multiple servers, multilevel security across specified workgroups, and archiving. You also forfeit the ability to manage documents other than those created in that specific program.

In its day, the Wang Word Processor, inspired by systems used on mini- and microcomputer systems, offered a somewhat more serious but still rather rudimentary form of document control. The system provided file-description information and fields on, for example, creation date, creator, last edited date, and editor. The profile screens that can accompany each file in Ashton-Tate's *MultiMate* are

descendants of the Wang approach.

The profile screen has survived to form the centerpiece of PC document management, but its range has been considerably increased. The profile screens of document managers form a networked database of indexed records that control the dozens of versions of documents existing at any given time.

When creating or retrieving a file using a document manager, the network user typically faces a profile screen, in what is called front-end profiling. (The manager may also have the option to require back-end profiling: requiring the user to fill in the profile screen upon exiting the document.) Fields typically include author name, calculated edit time, client, date created, DOS filename, subject matter, and many others.

Often, the network administrator has the authority to create additional fields in the profile screens, or at the very least to rename one or more of the existing fields. The network administrator may be able to select certain fields for mandatory input. In the case of a document's revision number, the administrator can have the



DOCUMENT MANAGEMENT SOFTWARE: SUITABILITY TO TASK

These suitability-to-task ratings assess how well each document manager helps monitor, manage, and search the multitude of files that can exist on a network or across networks. The ratings will help you see which most effectively handle vital tasks, ranging from the initial importing and indexing of networked files to protecting sensitive documents from unauthorized eyes and retrieving documents quickly and easily, even from distant servers.

THE TASKS

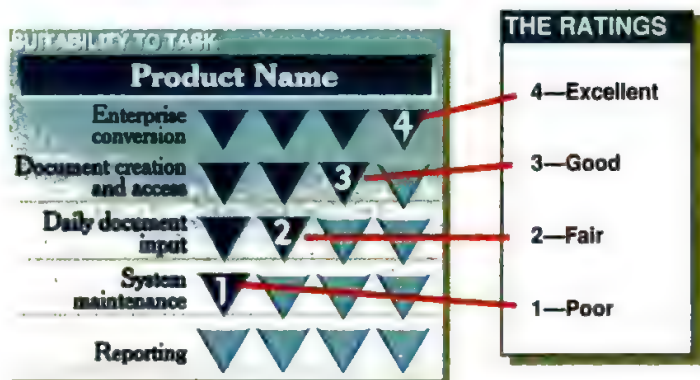
Enterprise conversion rates the package's ability to convert the files of an existing enterprise to the document management system. A likely candidate for document management is an organization with offices in multiple locations and with between 100,000 and 500,000 documents. These documents might vary in length from brief memos to 100-page proposals. Their form might range from random collections of ASCII text (such as *Lotus Express* messages) to *Microsoft Word* and *WordPerfect* documents and *Lotus 1-2-3* and *Microsoft Excel* spreadsheet files.

Document creation and access assesses whether the product makes creating documents a simple or cumbersome task. It also gauges areas such as the ease and speed of document search and retrieval (across both local and wide area networks), the handling of document modification, and the depth of security implementation.

Daily document input rates the software's effectiveness with incremental document addition. It considers the work involved in adding new documents within the system and in importing relatively small batches of documents created outside it.

System maintenance assesses the product's ability to fulfill daily maintenance tasks, such as deleting old users and adding new ones, changing access rights on documents or groups of documents, archiving and deleting documents, and performing backups.

Reporting rates the product's ability to log activities and create easy-to-follow printed reports, as well as its flexibility in creating customized reports.



Note: The sum of the scores should not be used for comparison and is not a factor in determining Editors' Choices.

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CIRCLE 194 ON READER SERVICE CARD

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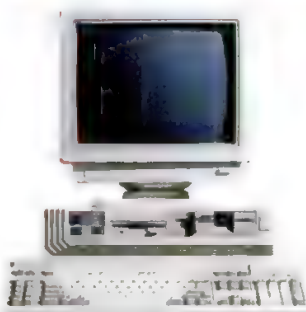
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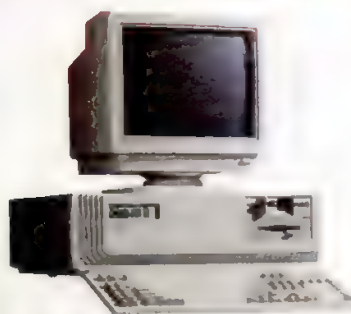
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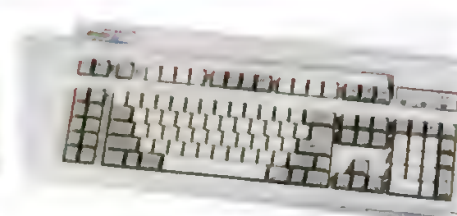
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- Interchangeable CTRL, ALT, CAPS LOCK Keys
- Unmatched IBM Compatibility
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\$89⁰⁰



OmniKey/ULTRA

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- Rate Select From 3-120 CPS
- Period/Comma Lock Key Locks out < > Even When Shifted
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CIRCLE 368 ON READER SERVICE CARD

CODE A1421

program itself name the file, number the revision, and store everything in a directory structure the software itself defines.

Users need not have any say in naming the locations where files will be stored in order for the document manager to be able to track them. Because the document manager makes a file's location irrelevant to users, they can concentrate on searching for the information they need. The most recent version of a document, after all, may be stored on the nearby server in San Francisco. If the product supports WANs, it also may be in London, at the opposite end of a wide area network.

NAVIGATING THROUGH DOCUMENTS

We conducted informal tests on each product's ability to import and fully index 1,500 ASCII text files, varying in size from 1 to 3,000 bytes. The files totaled 2.2 megabytes.

Each program we reviewed uses a different search engine for accessing documents. *PC DOCS*, a *NetWare*-specific product, uses *NetWare*'s own *Btrieve* engine to search profile screens. But since *Btrieve* can be slow in indexing full text—as seen in *Document Administrator*'s performance with the same engine on our informal tests—*PC DOCS* makes a proprietary index/search engine available in its \$295-per-workstation version. On our informal importing and indexing tests, *PC DOCS* provided faster performance than any of the other products reviewed here.

SoftSolution Global, also currently *NetWare*-specific, uses its proprietary *SpeedSearch* search engine. On our informal importing and indexing tests, the product lagged somewhat behind *PC DOCS*, but both it and *PC DOCS* beat *Document Administrator* by a mile at importing and indexing text. *ProFound* includes a proprietary engine to search text and catalog cards (the program's two-screen document profiles); full-text indexing is expected in the next version.

The programs we reviewed differ on the extent and types of searches the user can make. While you will find the usual Boolean operators AND, OR, and NOT, in addition to wildcards and nested search capabilities, each program imposes its own rules (or lack thereof) on which fields may actually be searched for data. Any field of *Document Administrator*'s widely customizable profile screens can be searched, in combination with a full-text search if desired. *SoftSolution Global* al-

lows searches on nearly all profile fields and on as many as 70 free-form fields you can imbed in word processing or full text documents, or both.

A full-text search of documents, even using any of the programs' stop-word lists, invariably takes a bit longer than a profile-only search, but ends in a snap with those programs that index text.

Searches can be set to take place on a specific server, if the location is known, or

*Because document
managers make a file's
location irrelevant to
users, they can
concentrate on
searching for the
information they need.*



across the entire network. Workgroups are defined for efficient operation when you first configure the software; the products we reviewed differ in the extent they let you make network wide organizational changes.

Most of these programs implement client/server architecture in some fashion. Except for *ProFound*, they work by letting the client workstation send a request—for indexing or searching, for example—to the *Btrieve* engine or to the program's proprietary engine. The processing to fulfill this request occurs on the server, with the results shipped to the local workstation.

LAUNCHING APPLICATIONS

Once you have found the version of a document you need to work on, executing a retrieve command will automatically launch the application, feed it the filename, and swap the document manager out of RAM, except for a small TSR kernel. The program can also create a file rather than load one once it launches an application.

With the exception of *Document Administrator*, these products show their origins in the legal marketplace by the

degree of integration with *WordPerfect*. For example, *PC DOCS*, which until its most recent version was a *WordPerfect*-specific product, retains full integration with this word processor. Press F5 to invoke *WordPerfect*'s List Files screen, for instance, and *PC DOCS* itself will pop up to offer the same capabilities, but with its own profile screen guarding entry of the file you wish to view, copy, retrieve, or otherwise manage. *SoftSolution* and *ProFound* can also intercept several *WordPerfect* keystrokes to deter file modification.

A document manager, however, need not be fully integrated with the application that creates files. All it must do, in fact, is monitor the network for attempts to read or write files, including such actions as renaming, copying, and deleting. Copy a new file onto the network from a floppy disk and a document manager such as *ProFound* or *PC DOCS* may not seem to notice. But try to access this file later and the program can then intercede, requiring you to account for the new file's presence in some way. *PC DOCS*, in fact, monitors the DOS interrupts for file input/output and can interrupt with a profile screen during most attempts to store ungoverned files. *SoftSolution* (without extra tweaking through the API) and *Document Administrator* allow users much more liberty.

For the savvy user, most of these programs are not without an array of loopholes that may permit actions such as shelling to DOS from within most applications that allow it. Unless the document management software takes precautions, an unscrupulous user can use EDLIN and quickly turn "hypoglycemia" to "hyperglycemia" in a document detailing a new prescription drug's usage, leaving no record of the change with the document manager. Alternatively, a user can circumvent some document managers by popping up an application's second window and creating files there.

By and large, these document management products address file security with enough finesse to thwart limited efforts to defeat the system. The network manager, or others permitted the rights, can assign access authority—often through the network operating system—by user, specified workgroup, or document type.

A user may have full editing rights to a document or may have viewing rights only via a built-in ASCII viewer. *PC DOCS*, *ProFound*, and *SoftSolution* in-

clude native file viewers for *WordPerfect*, and *Document Administrator* provides a range of native file viewers for word processors, spreadsheets, and even .PCX graphics files. None, however, offer the vast range of native file viewers found in programs such as *Magellan* and *PC Tools Deluxe*. *PC DOCS* will let you integrate a third-party file viewer.

Additionally, the products reviewed may permit a user to see only a document's profile screen, or deny the user even that—including the document title describing that secret merger deal.

Whether for legal purposes or merely for good network maintenance, these programs provide a way to purge or archive files. All of them can move certain files to a backup directory, sometimes automatically, and then update a field in the document profiles to reflect the change. The administrator can later back up the files according to established routine.

OTHER OPTIONS

There are plenty of other features available in these programs, including marking files to launch to a third-party program such as JuriSoft's *CompareRite* or Reference Software's *Grammatik*. All but *ProFound* will let you track paper documents, publications, and virtually anything that is not stored on the network. And all allow users to check out documents from the network for remote use at home or on the road. Just as if you were revising the file on your network workstation, the checked-out file is unavailable to other users until it returns to the system.

One vital function is built-in report writing, the quality of which differs greatly among the products. For all four, you can run some degree of customized reports, not only on billing-related data (say, for a case-by-case basis) but also on employee-related data—for instance, the time a worker has spent with various documents open versus the number of keystrokes.

A recently released add-on for *SoftSolution Global*, the *Image Manager* (\$75 per workstation), reflects features found in the growing category of image-processing software. Popularized by products such as Courtland Group's *Alexsys EZ/LAN*, Deerfield Systems' *DocuVision*, Compulink's *Laserfiche LAN*, and ImageTech's *Marvin*, these programs link devices such as scanners, optical disks, fax machines, and laser printers with a graphics-based database stored in a LAN server. Offering less sophisticated profil-

CONNECTIVITY DOCUMENT MANAGEMENT

ing capabilities than document managers, image-processing products provide ample benefits of their own, including support for multiple devices.

NETWORK-SPECIFIC

Naturally, the ideal document management program would run universally with any software installed on the network. But

Document management systems quickly make their presence a mere routine that imposes no undue hardship that might encourage resistance from users.



network operating system independence across a WAN is an entirely different matter. Currently, to take full advantage of each network's approaches to issues such as file locking, individual user configurations, and LAN-to-LAN communications, both *SoftSolution Global* and *PC DOCS* are network-specific with *NetWare*. (Upcoming releases of these products are expected to broaden their support to other LAN operating systems.) *ProFound* can run on any NetBIOS-compatible network, and *Document Administrator* comes in versions to address many PC networks.

None of these four products require a dedicated server, either for the program itself or for documents. The three products offering full-text indexing do run best if you set aside a PC dedicated to file indexing. Beyond this recommendation, the programs we reviewed place virtually no specific demands on the network.

Keeping demands few in number, in fact, is the key to the survival and growth of document management software. System managers want a program that will handle the flow of files without itself taking control away from MIS. The document management programs must work with existing network topology and layout without circumventing the operating system's security. And they must and do

permit some redundancy—an alternative way to access files the moment they are needed—through echoing to local drives or adjacent servers.

Company executives, in turn, want the best available means to get at updated and historically referenced information. They want easy report writing—templates from which they can run reports on how employees are spending the company's time and money. And they want to increase productivity by providing users with the information they need as quickly and with as little fuss as possible.

The four programs we reviewed are not always the best they can be at controlling the creation, location, access, and maintenance of LAN- or WAN-based documents. The best usage in a high-security work area, in fact, may be one of diskless workstations and a policy of locking out, through the network operating system, most users from sensitive subdirectories. Most of these products still count largely on a workforce that is either essentially trustworthy or at least ignorant of the hacker's craft—the majority who can create or call up a file, and know how to save or print it, but little else.

Document management systems, however, quickly make their presence a mere routine that imposes no undue hardship that might encourage resistance. Transparent searches, fluid version control, and subtle lockouts from unauthorized access all represent the beginning of a network in control. This means, in the long run, an organization in control of its very future.

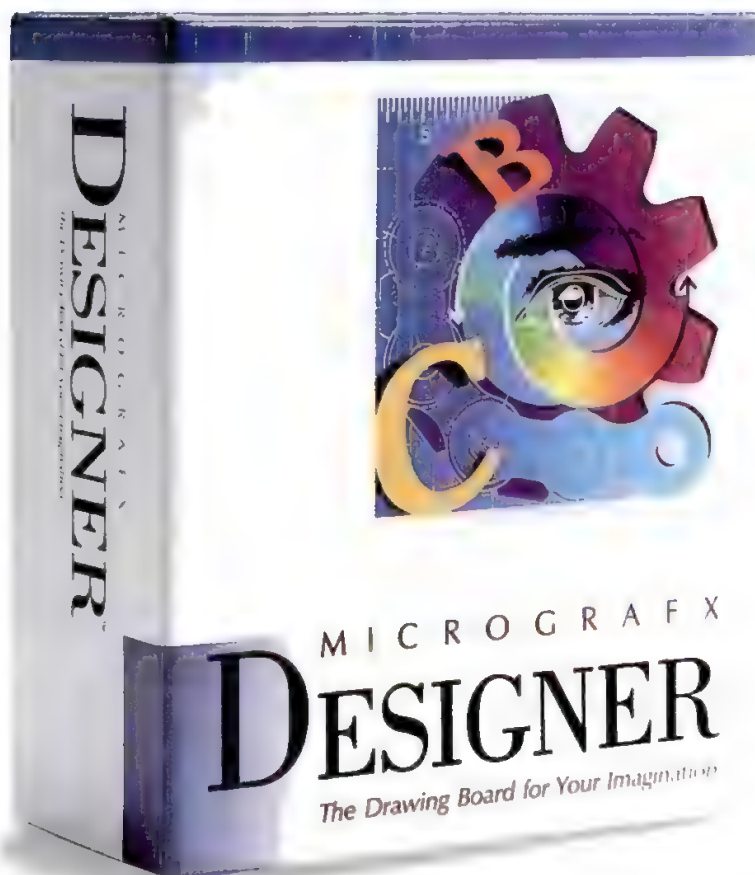
Document Administrator

by Joe Salemi



Interpreter Software Products' *Document Administrator*, Version 2.1, is a powerful if sometimes frustrating document management package. Costing \$2,495 for ten concurrent users, it features a completely configurable document profile screen, built-in native file viewers for a number of programs, and the ability to launch just about any piece of PC application software. Its inability to track document and user activity, however, as well as the relative ease of getting around the security it provides, make its use in highly sensitive environments questionable. Additionally, adding users can become a somewhat

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Dimensioning	Yes	No
Object snap	Yes	No
Maximum drawing size	132" x 132"	17" x 17"
Edit in full color	Yes	No
Clip art images	Over 1,700	750
Named symbols	Yes	No
PageMaker 4.0 filter	Yes	No
On line help screens	Yes	No
24 hour support	Yes	No

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FACT FILE

Document Administrator, Version 2.1

Interpreter Software Products Inc., 11455 W. 48th Ave., Wheat Ridge, CO 80033; 800-232-4687, 303-431-8991.

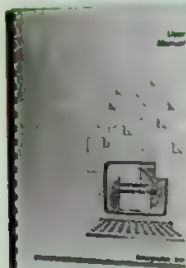
List Price:

Ten-user version, \$2,495; each additional user (in packs of five or ten), \$150. Single-user version, \$95.

Requires: NetWare 2.0 or later (versions available for LAN Manager 1.1 or later, 3+Share, VINES). **Server:** 640K RAM (with Btrieve NLM, 1MB RAM), hard disk.

Workstation: 512K RAM, hard disk, DOS 3.1 or later. 640K RAM recommended.

In Short: The ability to design custom profiles, perform searches on any element of a profile, and integrate any number of applications into its menu makes *Document Administrator* one of the more flexible packages we reviewed. But the lack of certain security and activity-logging features may make *Document Administrator* inappropriate for highly sensitive documents. The slow indexing process could make the initial import and indexing of your many existing documents a time-consuming task. The product can competently handle the daily document management needs of many organizations.



CONNECTIVITY DOCUMENT MANAGEMENT



DOCUMENT MANAGEMENT SOFTWARE SUMMARY OF FEATURES

Products listed in alphabetical order

Indexing In addition to the indexing abilities available in each product and noted on the features table, all the products can index by category, client, description, document number, or subject matter, as well as author or document entry operator. The author is the originator of the document; the document entry operator is the person who actually types it in. Often, the author and document entry operator are the same person.

Searching All the products support searching of document profiles by category, client, description, document number, keyword, or subject matter, as well as by author or by document entry operator.

Operators supported by all the products include AND, OR, and NOT. The products all support nested searches and wildcards.

Document access control All the products copy documents to a user's local drive for editing. All also have the ability to name files automatically. Additionally, *PC DOCS* and *ProFound* allow the user to call up the document manager from within *WordPerfect*, while *Document Administrator* allows the user to call up the document manager from within any application.

System access None of the products we reviewed keep a log of system accesses, nor do any keep a log of failed password attempts.

Data import/export All of the products we reviewed can import and export fixed-length or export delimited ASCII files. None can import or export data in the DBF, .DIF, SYLK, or .WKS formats.

	Document Administrator	PC DOCS	ProFound	SoftSolution Global
List price (tested configuration)	\$2,495 (10 concurrent users)	\$295 per workstation	\$995 (5 workstations)	\$2,495 per server, \$295 per workstation
INTERFACE				
Menu-based interface for administrator and user	■	■	■	■
Administrator can configure user menus	■	■	■	■
INDEXING				
On date of creation/date of last edit	■/■	■/■	■/■	■/■
On DOS filename	■	■	■	■
On full text	■	■	■	■
On keywords	■	■	■	■
On user-defined category	■	■	■	■
Uses stop-word lists	■	■	■	■
SEARCH TYPES				
Document profile searches	■	■	■	■
Document full-text searches	■	■	■	■
Proximity searches	■	■	■	■
Combined profile/full-text searches	■	■	■	■
SEARCHING				
Document profiles:				
By date of creation/last edit	■/■	■/■	■/■	■/■
By date/date range	■/■	■/■	■/■	■/■
By DOS filename	■	■	■	■
By user-defined category	■	■	■	■
Full text	■	■	■	■
Query by example	■	■	■	■
Create profiles of off-network documents	■	■	■	■
OPERATORS				
Exclusive OR	■	■	■	■
Equal/Not equal	■/■	■/■	■/■	■/■
Greater than/Less than	■/■	■/■	■/■	■/■
SORTING				
Any field	■	■	■	■
Multiple fields	■	■	■	■

■—Editors' Choice

■—Yes

■—No

CONTINUES

costly proposition. Although each additional user costs only \$150, you must buy this capacity in groups of five or ten.

You can run the program as a standalone or purchase a version for just about any type of LAN, but *Document Administrator* is most tightly integrated with *NetWare*. Users on other LANs must have a *Document Administrator* log-on identity and password; on a *NetWare* LAN, you can establish user accounts directly from the bindery. Users can go into *Document Administrator* without logging on.

Despite the somewhat obtuse documentation, installing *Document Administrator* is not difficult. Just pick a drive and run the installation program. The *DA-SUPER* utility lets you configure users and groups, applications, document profiles, the locations where documents and profiles are stored (it considers any type of file a document), and which users or groups have access to them and to specific applications. On-site training from Interpreter is available at a cost of \$1,000 per day plus expenses. You may want to take advantage of it because of the poor docu-

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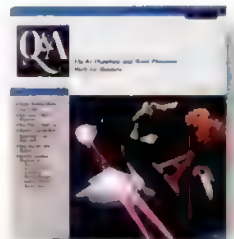
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mentation and the discount on technical support for trained supervisors.

Document Administrator uses the term *cabinets* to refer to different document directories. Cabinets can all reside on the same server or can be distributed across different servers on the same physical network. The wide-area network version of *Document Administrator*, which should be shipping by the time you read this, will be priced at \$2,995 for ten users; it will enable you to set up transparent user access to cabinets that reside on LANs in other locations.

MENU SYSTEM

One of *Document Administrator*'s assets is its ability to integrate any application into its own character-based menu system. A number of applications are predefined in the program's default menus, including *Lotus 1-2-3*, *Microsoft Word* (Version 4.x and 5.x), *PC Paintbrush*, *Symphony*, and *WordPerfect* (Version 4.2

Document Administrator				
Enterprise conversion	▼	2	▼	▼
Document creation and access	▼	3	▼	▼
Daily document input	▼	3	▼	▼
System maintenance	▼	3	▼	▼
Reporting	▼	2	▼	▼

and 5.x). Native viewers for these applications let users examine the contents of a document without having to run the application itself.

If an application allows multiple files to be open simultaneously, *Document Administrator* will catch and profile any document a user may try to create under a second window. Unlike the other programs we reviewed, *Document Administrator* is not integrated with *WordPerfect*. It does not intercept user keystrokes with tasks of its own.

When the user runs an application from the *Document Administrator* menu, *Document Administrator* swaps out, leaving a mere 9K of itself behind. A supervisor-definable hotkey lets users switch back to the *Document Administrator* screen to perform searches without leaving the current application.

Unfortunately, the assumption that *Document Administrator* will be the sole

CONNECTIVITY DOCUMENT MANAGEMENT

DOCUMENT MANAGEMENT SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

	Document Administrator	PC DOCS	ProFound	SoftSolution Global
RETRIEVAL				
Users can view documents without entering applications	■	■	■	■
Included native file viewers:				
<i>Lotus 1-2-3</i>	■	■	■	■
<i>Microsoft Word</i>	■	■	■	■
<i>Quattro Pro</i>	■	■	■	■
<i>WordPerfect</i>	■	■	■	■
<i>WordStar</i>	■	■	■	■
ASCII files	■	■	■	■
Graphics files	■ (PCX only)	■	■	Optional (\$75)
Supports third-party file viewers	■	■	■	■
NOTIFICATION				
Indicates who has a document	■	■	■	■
Provides document user's location	■	■	■	■
DOCUMENT ACCESS CONTROL				
By department	■	■	■	■
By project	■	■	■	■
By workgroup	■	■	■	■
By document status (private/public)	■	■	■	■
By administrator-defined class	■	■	■	■
By user-defined class	■	■	■	■
VERSION CONTROL TRACKING				
Number of previous versions program can track	99	98	99	99
Number of variants of each version program can track	26	26	N/A	N/A
ARCHIVING/DE-ARCHIVING				
By author	■	■	■	■
By category	■	■	■	■
By client	■	■	■	■
By creation date	■	■	■	■
By date	■	■	■	■
By description	■	■	■	■
By document entry operator	■	■	■	■
By document number	■	■	■	■
By DOS filename	■	■	■	■
By keywords	■	■	■	■
By last edit date	■	■	■	■
By revision number	■	■	■	■
By subject matter	■	■	■	■
By text occurrences	■	■	■	■
By user-defined fields	■	■	■	■
PURGING				
By author	■	■	■	■
By client	■	■	■	■
By date/date range	■	■	■	■
By document entry operator	■	■	■	■
By subject	■	■	■	■
Can purge activity log	■	■	■	■
SECURITY				
Uses <i>NetWare</i> security	■	■	■	■
User without rights may view profile	■	■	■	■

■ —Editors' Choice

■ —Yes

□ —No

N/A—Not applicable The product does not have this feature

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DOCUMENT MANAGEMENT SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order

	Document Administrator	PC DOCS	ProFound	SoftSolution Global
SECURITY (continued)				
Passwords required:				
To enter document manager	■	┐	┐	■
To access secure documents	┐	┐	■	┐
For administrative tasks	┐	■	┐	┐
DOCUMENT ACTIVITY LOGGING				
Checkout	┐	■	■	┐
Copying	┐	■	■	┐
Edit time	┐	■	■	┐
Keystrokes	┐	■	■	┐
Print time	┐	┐	■	┐
Retrieval without edit	┐	■	■	■
Viewing	┐	■	■	┐
REPORTS				
Administrator can customize reports	■	■	┐	■
Report fields:				
File accesses	┐	■	■	■
Files archived	■	■	■	■
Files deleted	■	■	■	■
Keystrokes per document	■	■	■	■
Pages printed per document	■	■	■	■
System configuration	┐	┐	■	■
Time spent editing individual documents	■	■	■	■
User entries into system	┐	■	┐	┐

■—Editors' Choice

■—Yes

┐—No

ENDS

applications is a challenge in itself, not to mention dealing with programs that swap to DOS via menu systems or commands rather than hotkeys.

Document Administrator also compromises security in that it lacks any type of audit log, leaving no means of telling how many failed password attempts have been made, or where or how long a user was in the system. Other programs we reviewed did not include these features, but *Document Administrator* also does not log retrievals without edits, viewings, copies, or checkouts for editing of a document. In any application, however, it will count keystrokes for billing and accounting purposes, and keep track of the number of times a document is printed.

FLEXIBLE PROFILES

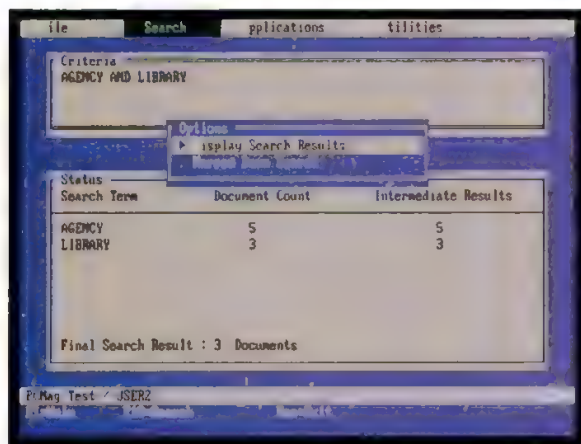
Document Administrator's biggest strength is its completely configurable document profile screens. You can either use the default profile provided with the system or create custom profiles with any of 38 different elements. The product provides for front-end profiling only. Document profiles can be for either internal or external documents, and you can establish access to different profiles by user or group. Internal documents are those stored and indexed by *Document Administrator*, while external documents are any stored outside the system, such as paper documents stored in file cabinets or many graphics files. Interestingly, *Document Administrator* will store and index the text components of .PCX files.

Users can make full-text searches, using exact text or wildcards and Boolean operators, on any of the elements of a profile, or on indexed documents. The software keeps profiles active for documents that have been archived off the system until the supervisor purges them, so the user can search for any document that *Document Administrator* knows about.

A copy of Novell's Btrieve engine included with the package lets you index documents on standalone machines or networks other than *NetWare*. If you're running *NetWare 386*, you can also use the NLM version of Btrieve that comes with the operating system.

The indexing process can be very slow, however. In our informal tests, it took *Document Administrator* over 24 hours to batch-import and index 1,500 of our test documents on a 33-MHz 486 system. If users need immediate access to full-text searches on the documents, set up a dedi-

Interpreter Software Products' *Document Administrator* allows you to perform successive full-text searches with wildcards and Boolean operators on indexed documents or any elements of its document profiles. You can also display the found documents through one of the native file viewers or through the application that created the document.



menu presented to the user leads to the biggest hole in its security. As long as users access files and applications through the *Document Administrator* menus, they cannot get to or see any documents stored in cabinets they do not have access to, or even their profiles. If users can get to the DOS command line, however, they have

complete access to any file in the system.

One solution is to map an application's shell-to-DOS hotkey to the same key as the *Document Administrator* hotkey, but since only one hotkey can be globally defined for swapping to the document manager, this is not foolproof. Finding a hotkey that can easily be used by all your

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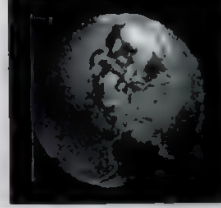
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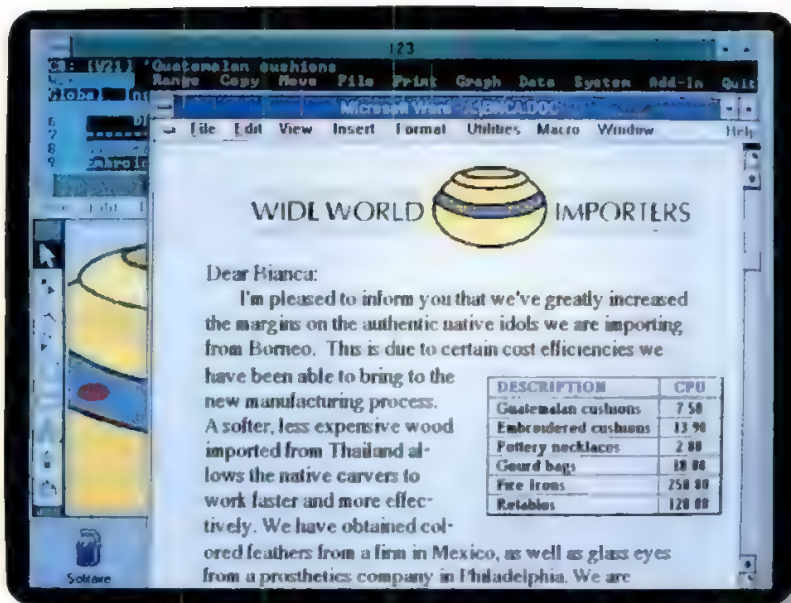
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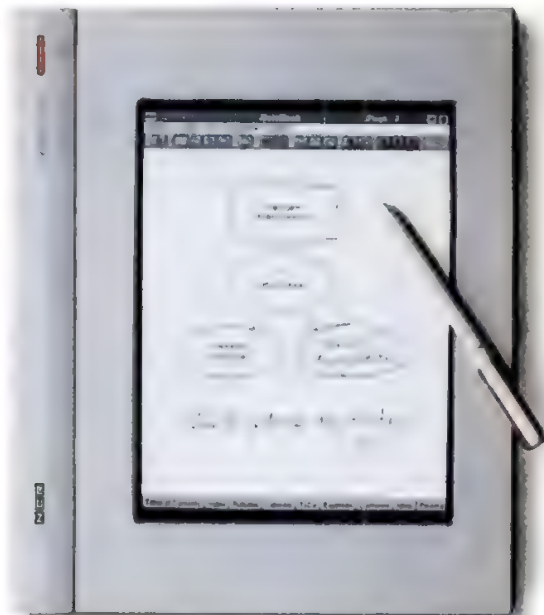
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The chart shows the dramatic increase in profits this could mean. There is of course one hazard involved in manufacturing the idols outside the realm of Borneo, but none of us here takes the cause very seriously.

Sincerely,

William K. Swenson, Esq.
VP Director of Imports
Wide World Importers
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Fine Irons	250.00
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cated machine with the indexing function constantly running. The time spent indexing is worthwhile; full-text searches on the test documents took only seconds.

As many as 99 major versions of a document and 26 minor revisions of each version can be active at one time. The program can be set so that a user does not overwrite existing documents. The software moves archived documents out of the *Document Administrator* directories to a storage directory, either on demand or according to the document's age. You can then copy the archives to tape, and delete them manually from the disk while still retaining the profiles. One nice feature of *Document Administrator* archiving is that you can set a "reminder" age; when the document reaches that age, its name flashes on the user's screen when it's accessed. The user can then decide whether to archive the document or reactivate it for another period.

Since *Document Administrator* is sold primarily through VARs and system integrators, support for it will usually come from the place where it was bought, as will help in initially setting up the system. Interpreter also provides contracted toll-free product support weekdays from 7:00 to 6:00 M.S.T.

A *Microsoft Windows* version of the product is scheduled to ship by early next year. The ability to print directly from *Document Administrator* is also promised for a future version.

Document Administrator's security and auditing weaknesses make it inappropriate for use with highly sensitive materials. Interpreter is aware of the security issue and is working on tightening it up in the next release. The flexibility and the speed with which it conducts searches, however, will allow *Document Administrator* to handle the document management needs of many other organizations.

PC DOCS

by Gary Berline

Version 4.0 of *PC DOCS*, from the company of the same name (a subsidiary of Customized Management Systems Data Corp.), lets struggling network managers level the mountains of documents they face. Easy setup, powerful import capabilities, an efficient interface, fast indexing, and faster search-and-retrieval help put *PC DOCS* ahead of the document

CONNECTIVITY DOCUMENT MANAGEMENT

FACT FILE EDITORS' CHOICE

PC DOCS, Version 4.0
PC DOCS Inc., a subsidiary of CMS Data Corp., 124 Marmott Dr., #203, Tallahassee, FL 32301; 800-933-3627, 904-942-3627.

List Price: With full-text indexing, \$295 per workstation; without full-text indexing, \$225 per workstation.

Requires: *NetWare 286 2.15c* or *2.2*, or *NetWare 386 3.11*. **Server:** 5MB RAM, hard disk. **Workstation:** 640K RAM, 1MB of extended or expanded memory. DOS 3.3 or later. Hard disk recommended.

In Short: *PC DOCS* does not allow administrator-definable profile fields, nor does it prevent users from overwriting document originals. Its support is currently limited to *NetWare*. A wealth of easy-to-use options make up for these few drawbacks by providing network administrators with the control they need over documents. *PC DOCS* offers powerful abilities, including easy initial conversion of enterprises, and, via a TSR that tracks DOS file activity, optional tracking of every document created, opened, or modified. It is priced somewhat higher than some of its competitors, but users will find this well-designed document manager worth the cost.

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management competition. At \$295 per workstation for the version we tested, which is capable of full-text indexing, or \$225 if you only need to search document profiles, this entrant runs decently in the price-competition race. Slightly more expensive than some of the other entrants, *PC DOCS* is well worth its cost.

A few drawbacks aside, the program is one of the best-designed in its class. Among its faults are support for only *NetWare* and a lack of administrator-definable profile fields for describing a document. Most seriously, no facility exists, even as an option, to prevent users from overwriting document originals.

On the plus side, *PC DOCS* makes installation a breeze, even on wide area networks. Careful planning is always necessary when setting up a document management system, but unlike *Pro-Found*, *PC DOCS* offers excellent flexibility while keeping you from getting lost in a forest of options. It includes wisely chosen defaults for its numerous options.

The administrator can change them, but they provide welcome guidance.

You might—if you really know your LAN (or WAN)—contemplate a do-it-yourself adventure. The vendor, however, sells only through VARs, so you will get the additional benefit of their professional guidance. Given the overall complexity of this product category and the weakness of the *PC DOCS* manual, time spent in training will not be wasted. The company provides training through both local vendors and authorized third-party training centers in major cities; alternatively, it can send its trainers to your facility. The cost for the latter option is \$600 per day plus expenses.

PC DOCS stores document profiles in a library on the user's home file server, either automatically assigning the directory structure or allowing the administrator to do so according to profile fields such as author, client, subject matter, document type, and several others. Only four of these fields allow renaming, however; no facility exists for creation of new fields and formats. A handy feature lets you link document profiles.

INDUSTRIAL-STRENGTH MANAGER

Industrial-strength import features tame the often-formidable task of bringing a new system on-line. *PC DOCS* integrates tightly with *NetWare* and can snatch user names from the bindery, Novell's server-resident security database. The software supports manual creation of users; it will also import the user information from ASCII files, unlike some other products reviewed here.

Certain lists require creation before the system becomes functional, including tables that display the applications the program can launch, valid document types, clients, keywords, subject matter, document authors, and users. The program allows bulk importation of documents if you first set defaults for the profile fields, thus avoiding the need to stop and enter the information for each file.

PC DOCS can track files created within an application but optionally generates a less intrusive environment by waiting to present the list of documents for profiling until the user exits. (With *WordPerfect* files, back-end profiling is always in effect.) The developers chose Novell's Btrieve engine to carry out profile indexing but implemented a fast, proprietary index/search engine for full text that blazed through our test files in less than 2 hours.

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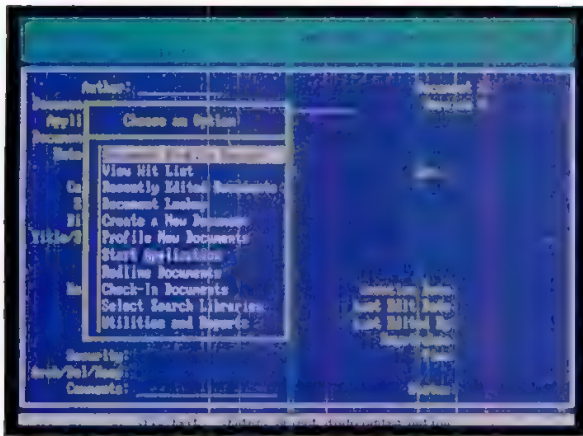


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PC DOCS stores document profiles in a library on the home file server, but you can perform searches and retrievals without considering where documents actually reside. The administrator can allow users to select a directory and server location when searching for files. Users can construct search queries from logical combinations of nearly any of the profile fields.

Full-text indexing can execute on a nondedicated machine or continuously on a dedicated machine.

INTUITIVE INTERFACE

A functional and intuitive character-based interface makes learning and using the product easy. Users construct search queries from logical combinations of nearly any of the profile fields by filling in blanks or choosing from validation tables. *PC DOCS* also allows inclusion of date ranges. The \$295-per-workstation full-text version enables word searching, with proximity searching as an administrator-controlled option. Searches zip by and retrievals appear in a blink. A nifty convenience lets you choose documents from a list displaying your last 20 accesses, a real time-saver that shows the product's attention to ease of use.

The program also displays robust wide-area network capabilities. Files and profiles may exist on any server in the wide area network. With the exception of specially secured documents, the user performs search and retrieval without regard to where items actually reside. Users can specify the directory and server location when searching for files, but they generally do not need to. Document searches occur automatically across all libraries determined by the administrator, but the user can modify the scope if given the appropriate rights.

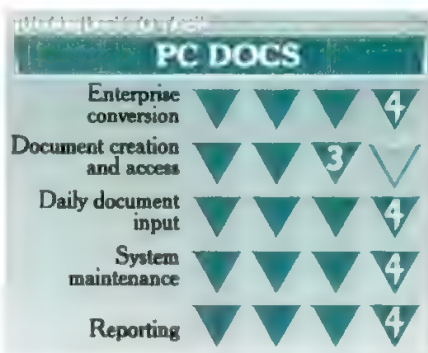
Maintenance procedures exhibit the same power found throughout the program. *PC DOCS* helps balance the network load by allowing the transfer of documents and profiles between systems without affecting user searches. It lightens network traffic by letting users edit files on their local drives. A versatile

archive routine accepts nearly every combination of profile fields for determining documents to offload. Unlike *Document Administrator*, the system maintains full-text search capability, even for archived documents.

VERSATILE LAUNCHING AND MONITORING

PC DOCS provides numerous program-launching capabilities, such as execution from a document manager menu item, inclusion of command line parameters, and more. You can set the program so that it does not launch an application until after the user has created a profile. You can also restrict users or groups of users from accessing certain applications. The product can launch any application and comes with configurations for many popular ones.

Mirroring much of the competition, *PC DOCS* demonstrates much stronger integration with *WordPerfect* than with other applications, including a native file viewer for *WordPerfect*. By monitoring keystrokes in *WordPerfect*, it can substitute its own actions in response to certain *WordPerfect* key combinations, but not to *WordPerfect* menu selections.



PC DOCS pulls well ahead of the pack by allowing complete monitoring of files created under any DOS program. Many document management packages let you monitor only *WordPerfect* files this completely. A 26K TSR provides the magic by tracking DOS file creates, opens, and writes. (This measure should even prevent you from losing track of documents users might create in an application's second window.) With *PC DOCS*, you do not have to worry about preventing users from shelling out to DOS, because anything they do to any files will be noted by the TSR. Although users can initially create a document without a profile, the program can force them to profile it at some point.

The software optionally logs all file accesses or attempts and can also track keystrokes, time spent actively editing, and pages printed. It can then produce reports based on logical combinations of most profile fields, sorted and formatted according to the administrator's preference.

PC DOCS puts considerable power into the users' hands but still manages good security and control, with one notable exception: Within an application, anyone may overwrite a document's original copy, simply by saving over it. Even with a version-control system that can track 99 major revisions and 26 minor ones when activated, the user retains final say. No configuration or setup option lets the administrator require users to create a new version, so users can overwrite files without the original version being saved. The most an administrator can do is set the system to query the user as to whether it should make the about-to-be-created document a new version. The lack of an option to force the creation of new versions is especially perplexing in light of the excellent design.

The company provides free but not toll-free telephone support weekdays from 8:00 A.M. to 8:00 P.M. E.S.T. Upgrades come only via a software subscription that costs \$45 per year for each workstation with the full-text package. (Note that the price increases for users who wait longer than 90 days after buying the package.) The company plans to release versions for *LAN Manager*, Unix, and *VINES*, as well as a version of the product that will fully support *Microsoft Windows*, sometime in 1992.

PC DOCS provides the ease of use, flexibility, and heavy-duty control func-

tions often needed on networks these days. It has a few flaws, but helpful maintenance features, fast text indexing, and a quick search routine make this document manager one of your best bets. The product shines as a solution for administrators who need a powerful way to bring networked documents under control.

ProFound

by Wendy Dugas Pérez

You've certainly heard of Wang, but as its name has slipped in recent years, you've probably heard less about its software. Wang Informatics Legal & Professional Systems' line of software for the PC includes *ProFound*, Version 2.1, a docu-

ment management system that you can run on *NetWare* or any *NetBIOS* LAN or WAN. Prices start at \$249 for one workstation and \$995 for the five-workstation version we tested. At \$249 for each additional workstation beyond that, *ProFound* could become expensive; you would be wise to investigate Wang's site-license and corporate-license options. Users will find that *ProFound* does what it purports to do but is not as well-rounded a product as its competitors.

Wang includes a fill-in-the-blanks booklet designed to make you think about how you want your document-management system structured. Setup requires that you decide which applications you want to launch, where you want backup

and archiving directories located, where you want to store files, who your users are, what security they will have, and a plethora of other options.

Neither the guidebook nor the setup procedure contains enough information to help you make the most effective choices. For instance, once the product was up and running, we ran into situations in which certain options simply would not work. It turned out that we had not set up the product to support these options, because it wasn't immediately obvious that we should have. You may want to take advantage of Wang's training programs to avoid mistakes from the start. You will generally pay \$300 for classroom instruction and \$100 an hour on-site. Wang also provides free technical support at a toll-free number from 6 A.M. to 8 P.M. M.S.T.

MEZZANINE: A Different Approach to Document Management

by Wendy Dugas Pérez

By and large, the products we look at in the main review are effective for offices of all sizes, from three-employee organizations that need to track thousands of documents to large businesses that must control hundreds of thousands of files. Saros Corp.'s *Mezzanine* provides an effective alternative tool for large-scale organizations with a wealth of files to manage, although it can be a less practical choice for smaller organizations that need a ready-to-run solution.

The reason lies in the way that the product approaches document management. *Mezzanine* is only a document management engine. It does not include a built-in front end. While that gives organizations with the appropriate resources the welcome opportunity to build their own front ends and fine-tune the system to their specific needs, smaller companies might not have the personnel on hand to handle that task. The product costs \$2,950 per server, plus \$195 for the *Workstation Access Package* required for each workstation. While complete third-party front ends are available for *Mezzanine*, they represent an extra investment that some smaller companies might not be able to make.

Mezzanine also differs from the other programs we review in that it is

based on Microsoft's *OS/2 SQL Server*. You can install it only on a network capable of supporting *OS/2*. You can have *DOS*, *OS/2*, or *Microsoft Windows* clients on the network in addition to the systems running *OS/2* that are required by *Mezzanine*. The network must also support Named Pipes interprocess communications between *OS/2* and *DOS*.

Mezzanine relies on client/server architecture to accomplish its functions. The engine typically requires that the network be equipped with one *OS/2* machine to act as its catalog server and another as its *OS/2* branch server; in small installations, one *OS/2* machine can conceivably serve both functions. (On Novell networks, this is in addition to the standard *NetWare* file server where the document management database is actually stored.) The catalog server is the brains behind the system; it searches for user requests for files and then sorts them. Once the catalog server alerts the branch server to a user's requests, the branch server processes the request and delivers the file to the workstation.

FEATURES AND FUNCTIONS

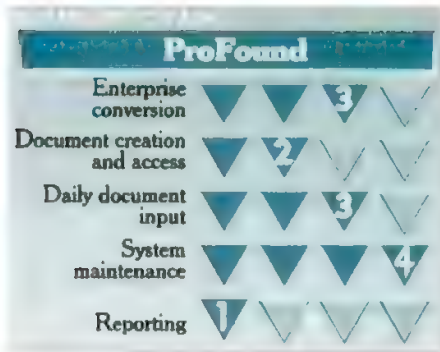
The *Mezzanine* engine supports most of the functions supported by the document managers in the main review. How they are implemented and repre-

sented to the user is, however, a function of the front end. For example, users can search on profiles, but whether the profile screen appears as a catalog card or simply a list of fields depends on the front end. Users can also sort on the search results, as with most of the document management products in the main review.

You cannot design your front end to do full-text searches or full-text indexing of documents, because the engine does not support it. The best it can do is be integrated with a third-party full-text indexing package.

Like other packages, *Mezzanine* has transparent support for multiple servers on the same network and across wide area networks. And like other document managers, *Mezzanine* implements some of its security features in the form of access control. Users can be assigned varying levels of access, from most to least restricted. For example, you can be assigned no access privileges whatsoever, or you can retain viewing privileges only. Author, owner, and administrator privileges provide the user with the greatest freedom to view and alter documents.

Mezzanine also offers version tracking, just like the products in the main review. You can set the number of versions of a document you would like to keep, and create a front end that speci-



OPERATING BY CARD CATALOG

ProFound operates on a card catalog analogy. The program stores document cards—basically, profiles—in what the program terms *catalogs*, which are just the server directories that you specify. It's preferable to store related document cards

in the same area. For example, in order to save the users' time, an administrator might want to set the program so that the accounting department does not have to search through the legal department's catalogs. Files, or documents, are stored in sections, which are also directories on the server. The use of sections provides a way to group documents according to your preference; for example, Section A might hold all your *WordPerfect* documents; Section B might hold any *Lotus 1-2-3* file created before a certain date.

You are limited to 26 catalogs and 26 sections per copy of *ProFound*; the program lets you set various levels of administrative security and access rights to them. How you structure these catalogs and

sections could affect the performance of *ProFound* on your LAN or WAN—another good reason to take advantage of training from the company.

While the administrator makes the decision about the sections in which files will be stored, *ProFound* automatically and transparently names the files. The administrator can set an option in the system maintenance screen to specify whether the program will prevent users from overwriting original files. The administrator might determine, for instance, that users can create five revisions to a file and that the sixth will overwrite the original document. The program allows for up to 99 versions of a file and makes no distinction between major and minor revisions.

For each document, *ProFound* main-

ties that it never overwrites the original, if you like. Archive management and backups are also available from *Mezzanine*.

ADDING A FRONT END

Saros provides several solutions for incorporating a front end into its *Mezzanine* engine. Its \$125 *FileShare* add-on gives the system administrator a Windows-based interface to *Mezzanine*'s features. *FileShare* can be used as a front end for your users, but it costs \$125 for each user.

A better way for companies with programming staffs to give *Mezzanine* a front end is to use one of Saros's three programming languages. Saros offers its *Software Development Kit* at a cost of \$1,000 per programmer. It includes the Saros Application Macro Language (AML), the Dynamic Data Exchange (DDE) Interface, and the Saros Application Program Interface (API). Which of these three languages you choose depends on what is best for your programming staff and the level of functionality that you require.

The Saros AML interface can be used either with a DOS application and its own macro language or alone to provide a DOS interface to *Mezzanine*. The DDE Interface supplies complete *Mezzanine* functionality for Windows applications. The Saros API gives you

the ability to create front ends with complete *Mezzanine* functionality through a set of object-oriented C subroutine calls. You can program front ends using this for DOS, OS/2, or Windows workstations.

In addition to Saros's offerings, several companies produce their own front ends for *Mezzanine*, which Saros resells. *Viewz for Microsoft Excel for Windows* (\$199) and *Viewz for Microsoft Word for Windows* (\$150) from Gilbert and Associates are already shipping. So is the \$395 *WordPerfect*-based *reQuest for DOS* from Harris and Paulson (303-773-8283), which Saros does not resell. Since these are front ends for specific application packages only, they will not give you complete *Mezzanine* functionality across all your applications. Windows users can look forward to another product from Harris and Paulson, *reQuest for Windows* (\$495), which should be shipping by the time you read this. Another product shipping in this same time frame (and resold by Saros) is the \$495 *Spectacle* from Horizon Software Development, which will add to *Mezzanine*'s image management features.

Mezzanine is not a document management offering for the faint of heart, or the shy of personnel. It requires an organization with the resources to implement a hand-tailored front end effectively, or at least with the capital to

make the additional investment in a *Mezzanine* or third-party offering. It also requires a network administrator familiar with OS/2. The documentation is fairly technical; you will want to train your administrators. The lack of full-text indexing needs to be corrected, but in other respects, *Mezzanine* proves a sophisticated engine to which you can attach the front end best-suited for your organization. ■

Mezzanine, Version 2.05

Saros Corp., 10900 NE 8th St., 700 Plaza Center, Bellevue, WA 98004; 800-827-2767, 206-646-1066.

List Price: \$2,950 per server. *Workstation Access Package*, \$195 per workstation. *FileShare*, \$125 per workstation.

Requires: 286-based PC or better; 640K RAM plus 384K expanded memory; DOS, *Microsoft Windows* 2.x or later, or OS/2 1.2 or later.

Catalog server: 386-based PC or better, 8MB RAM, 80MB hard disk, OS/2 1.2 or later. **Branch server:** 386-based PC or better, 4MB RAM, 40MB hard disk, OS/2 1.2 or later.

Compatible With: *LAN Manager* 1.0 or later; *Net-One*; *NetWare* 2.15 or later, *Advanced NetWare (ELS II)*; *SFT NetWare*; *3+Open* 1.1 or 1.1e; *VINES*.

CIRCLE 611 ON READER SERVICE CARD

CONNECTIVITY DOCUMENT MANAGEMENT

tains an activity log that includes information on the date of last access, the revision number for each activity performed on the document, the operator performing the activity, the time spent in the document, and a description of what was done.

SLOW SEARCHES

You can search and sort on the document cards in up to 21 fields, including file name, title, department, type, author, operator, and client/matter. You can connect fields with Boolean operators. You can also name and save these criteria in case you need to perform the same search on a regular basis.

Unlike all the other products we review here, *ProFound* lacks full-text indexing of documents. Its proprietary index engine indexes only the information in the document cards. Without full-text indexing, full-text searches of documents take significantly longer for *ProFound* than for other products we saw. On our informal tests, the product took about 12 minutes to search for a word in a document.

ProFound supports a full-text location feature that lets you use a third-party full-text search-and-retrieve product, but Wang realizes that built-in support in this area is needed. In Version 3.0, due out in the first quarter of 1992, the company plans to include it. (Wang also plans to release a Windows version but has no information on a release date.)

The package can search across multiple servers on the same network or a WAN. With Version 2.1, however, processing occurs on the local workstation, causing more communications across the WAN connection as the program searches for documents. Version 3.0 will operate just as, for example, the current implementation of *PC DOCS*; it will be able to

process documents on the remote server and, by shipping just the results to the local workstation, save valuable time.

CATALOGING YOUR WORK

Each user is assigned a work area specified by the administrator. It can be located on the server or even in a directory on the local hard disk. The files that users create and store to their work area can be automatically tracked by *ProFound*, even though *ProFound* may not be loaded when the user creates the file. Once *ProFound* is called into action, a directory synchronization option checks the user's work area for new files and automatically creates document cards for them. After the user edits the document cards, the files can be transferred from the user's work area into the appropriate sections of the server.

Any documents created outside of the user's work area—for example, in another directory on the local hard disk—are not tracked at all. This means that a network administrator could lose track of some of the files that the users create.

When creating a file inside an application launched by *ProFound*, the document manager demands that you first create and fill out a document card. This is true even for *WordPerfect*, unless you select the option that allows for full *WordPerfect* integration. (One reason you may not want to choose that option is that leaving the required *ProFound* kernel resident takes up 64K.) If you do select the option, users can choose to fill out a document's card while they are in the middle of working on a *WordPerfect* file. Additionally, *WordPerfect* actions for listing, retrieving, or storing documents are intercepted by *ProFound*; the program substitutes its own tasks for them so



ProFound, Version 2.1

Wang Informatics
Legal &
Professional
Systems Inc.,
2111 E. Highland
Ave., #400,
Phoenix, AZ 85016;
800-777-4785
List Price: Five-
user version, \$995,
each additional
user, \$249.



Requires: LAN Manager, NetWare 2.11 or later, or any NetBIOS-compatible LAN.
Server: 5MB RAM plus 1MB RAM per 4,000 documents, hard disk. **Workstation:** 640K RAM, DOS 3.1 or later.

In Short: *ProFound* provides most of the basics of document management, but it lacks some important features, such as full-text indexing. Without it, searches take much longer than with the other products we reviewed. *ProFound's* report-writing capabilities need improvement. Setting up the program is not as painless as it should be. Wang is working on correcting some of the program's problems, but look elsewhere if you can't wait.

CIRCLE 420 ON READER SERVICE CARD

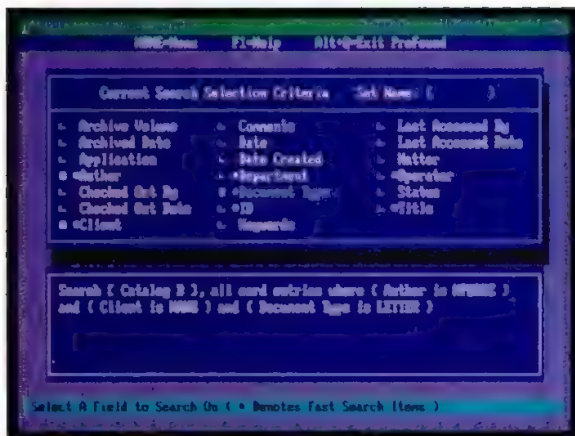
that files do not fall through the cracks. And if you open a second document window in *WordPerfect*, *ProFound* will know about it and make you account for it.

The program only prevents shelling to DOS from itself and optionally from *WordPerfect*. Users of other applications can shell to DOS without any restrictions, which can become a problem for network administrators who want to keep their documents secure. The program does have an option to let you make password-protected documents invisible to the DOS directory command, which can counteract this problem to a degree.

MAINTENANCE FEATURES

An automatic backup feature enables you to set up storage locations for each section and user work area, but if you need to restore files, you must do it from the DOS prompt. *ProFound* also lets you pick groups of files or mark individual files for archiving. You can purge documents in the same manner. Both archiving and purging activities are tracked in the document activity log.

ProFound allows you to print out a variety of reports, including disbursement reports. But with many types of reports,



You can search and sort *ProFound's* document cards in up to 21 fields using criteria such as date created, and subject matter. *ProFound* uses the term *catalog* to define server directories where files are stored; you can further subdivide catalogs according to departments (or other appropriate designations) and have the system search across only a single catalog.

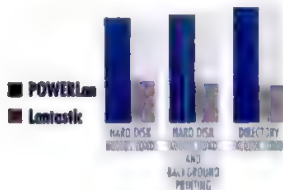
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DOS Networking

"POWERLan swept all of the performance categories on our benchmark tests."

"If you need to link DOS, OS/2, Unix, and other platforms in an interoperable network ... POWERLan is the product to choose"

"you can't ignore this powerhouse, POWERLan's features speak for themselves; its speed convinces"



June 25 1991
POWERLan Version 2.10

POWERsave

Network Backup

"This is the fastest single-file restore we found in any of the systems, including server-based units. We didn't believe it either until we ran the test three times."

"simple to use"

"Performance Technology may have the fastest workstation-based drive in Netwaredom."

"offers excellent progress tracking"

"operates ... at warp speed"

LAN Times, June 17, 1991



Sure, we like to make products that go fast. But, performance is just one quality we take seriously. Operating in multi-vendor environments is high on our list too. And there's lots more. Call us to get the rest of the story.

POWERfusion

DOS - UNIX Connection

"In our benchmark tests, Performance Technology lived up to its name."

"... the POWERfusion family can support large networks of busy users and still deliver"

"If you're looking for a way to connect your Unix box to a network of DOS-based PCs, look no further."



May 28 1991
POWERfusion Version 1.3

"Performance Technology is selling glue technology that can help solve a variety of local- and wide-area networking problems. Lord knows, that's something we all need."

BYTE, March 1991

POWERbridge

LAN to LAN Connection

"Usually I wonder about a product that has 'power' associated with it, but POWERbridge ... deserves the honor."

"POWERbridge supports nine operating systems ... links all the networks you'll ever have."

LAN Times, February 4, 1991

"... well, you haven't lived until ... (you) ... hop through a NetWare LAN to an SMB server running under Unix" (with POWERbridge)

BYTE, March 1991

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512-349-2000**



you cannot narrow down categories or customize the fields that get printed. Rather than simply letting you print a report that shows all the document cards in Catalog A, for example, it will output the contents of all the document cards in the other catalogs as well.

The version of *ProFound* we reviewed just cannot stand up to the competition in this market, but Wang is correcting some of the product's failings. Currently, *ProFound* lets you handle basic document management, but not as quickly, easily, or conveniently as other players. If you need a more full-featured package and cannot wait until *ProFound*'s next release, look elsewhere.

SoftSolution Global

by Ed Perratore

SoftSolution Global is the NetWare-specific, WAN-capable version of SoftSolutions Technology Corp.'s network-independent *SoftSolution Advanced*. Priced at \$2,495 per server and \$295 for every attached workstation, *SoftSolution Global* offers extensive user configuration, speedy full-text indexing and searching, and as many as 70 user-defined searchable fields that you can input into a document itself. It does not yet offer complete protection from security violations, precise date handling, or adequate activity logging.

You set up *SoftSolution* by first completing the manual's recommended checklist, defining workgroups, and assigning rights and log-on passwords for each user. If you follow the documentation closely, you can probably install *SoftSolution* yourself. It is very comprehensive, laid out well, and targeted toward both the systems integrator and network administrator. The complex nature of these products means, however, that many users will likely benefit from professional training. *SoftSolution* is typically sold through system integrators, who can certainly help with training, or directly. SoftSolutions provides training at a cost of \$1,000 per day plus expenses, or at its headquarters for \$750 per day.

The version we saw could not import user names from the Novell bindery, although SoftSolutions should release a utility to allow that by the time this issue hits the stands. Though the ability to import

CONNECTIVITY DOCUMENT MANAGEMENT

users from ASCII files or other formats is not built-in, the API included with the program can be set up to handle this.

PROFILING YOUR DOCUMENTS

Profiles in *SoftSolution* are not as customizable as the ones in *Document Administrator*. You can redefine only client and subject-matter fields. Nevertheless, your options are many. You can set fields to require mandatory input. The program lets you embed user-defined fields at the beginning of any document. While you must fill in any mandatory fields before entering a new document, you do not have to supply information for the other fields until after you exit. Only front-end profiling, however, is available for existing documents.

SoftSolution also supports a compound document feature that lets you use one profile for related files, such as word processing and spreadsheet files. An optional add-in we did not review, the *Image Manager*, which costs \$75 per workstation, lets you manage scanned-image documents and OCR-created ASCII files tied together under one document profile.



SoftSolution Global, Version 2.0

SoftSolutions Technology Corp., Parkview Plaza, 625 S. State St., Orem, UT 84058; 801-226-6000.

List Price: Each server, \$2,495; each user, \$295.

Requires: NetWare

2.0 or later. Server: 256K RAM per data set, hard disk. Workstation: 200K RAM, DOS 3.1 or later.

In Short: *SoftSolution Global* is a first-rate document management system in many respects. It includes an API that is more customizable than the other products, boasts quick indexing and speedy searches, and offers up to 70 user-defined searchable fields per document. SoftSolutions markets an extra-cost add-on that lets users manage their images as well as their text documents. The security for tracking documents could be improved, and the program would benefit by incorporating precise date handling and better activity-logging features. Even with those drawbacks, the product is a feature-rich document management tool.

CIRCLE 421 ON READER SERVICE CARD

SoftSolution Global				
Enterprise conversion	▼	▼	▼	4
Document creation and access	▼	▼	3	▼
Daily document input	▼	▼	▼	4
System maintenance	▼	▼	3	▼
Reporting	▼	▼	3	▼

It includes hooks to the LaserMaster SXI printing and scanning card and the Fujitsu scanner line. *Image Manager* lets you view .PCX and TIFF files; it can also convert and print graphics files (the only printer support *SoftSolution* itself offers is ASCII dumps) and compress or decompress them.

One drawback to *SoftSolution* is that it makes no distinction between the last retrieved file and the last edited file. Its ASCII viewer lets you see the contents of a file, but for applications such as spreadsheets, the file contents appear too garbled to be of much help. Therefore, you must retrieve the file even if you plan to make no changes. The problem arises from the program making the same note on the document's profile screen as it would if you had retrieved the file and saved it to the same name after making changes.

IMPORTING AND INDEXING

Importing documents to the system is easy. The installer completes a default profile (listing application type, author name, client, subject matter, or other fields specified by the network administrator) for the documents to be moved or copied into the system. Files can be imported in batches according to each default profile created. Full-text searches of documents require indexing of all the files you will want to search. *SoftSolution* has a proprietary index engine.

Importing and indexing the 1,500 documents of our informal test took a little more than 3 hours. Searches took mere seconds. Like the other two products that perform full-text indexing, *SoftSolutions* recommends dedicating a PC to handling the indexing requests of the stations, as the operation is CPU-intensive.

SoftSolution can track as many as 99 versions of a file, but it makes no distinction between major versions of a document and minor revisions to it. In general, users must specifically select the version-

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CIRCLE 740 ON READER SERVICE CARD

Seagate's Low-Profile 3.5" Drives

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Wood Sculpture by
Daryl Kalmus
Cincinnati, Ohio

Balance, motion,
volume: the
raw materials

of art—and technology. At Seagate, we've consistently excelled in packing the features you want, plus the performance you need, into an elegantly compact package.

Seagate's 1" high, 3.5"-inch disc drives—the ST3120, ST3144, ST3283, ST3500 and ST3600—offer performance levels unusual even in full-form-factor drives. These advanced drives are ideal for performance-oriented applications where size, weight and power must be kept to a minimum, such as high-end laptops and portable workstations.

Available in AT, SCSI-2 and Fast SCSI-2 interfaces, the drives combine a 3,600 RPM or 4,500 RPM spindle motor with Zone Bit Recording (ZBR) to offer access times as low as 9.9 msec. Power consumption is from 3.5 to 5 watts, and capacities range from 106 to 525 formatted megabytes.

When creativity and craftsmanship combine, the result is art. For complete product specifications, contact your authorized Seagate distributor or call Seagate directly at 800-468-DISC or 408-438-6550.



Seagate

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CONNECTIVITY

DOCUMENT MANAGEMENT

control option to create a new version of an existing file. The program will not make users create new version numbers for files that they change, unless the network administrator has programmed the system through the API to force them to do so.

The system classifies rights as public, semiprivate, and private. Public files can be readily accessed and modified as needed. Semiprivate designates that only the author (the person who gets credit for the document) and creation user (the person who actually typed it) get full access to the document and its profile; all others receive only view and copy privileges. Private grants access rights only to the author and creation user; any other user cannot even tell that the file exists from within *SoftSolution*.

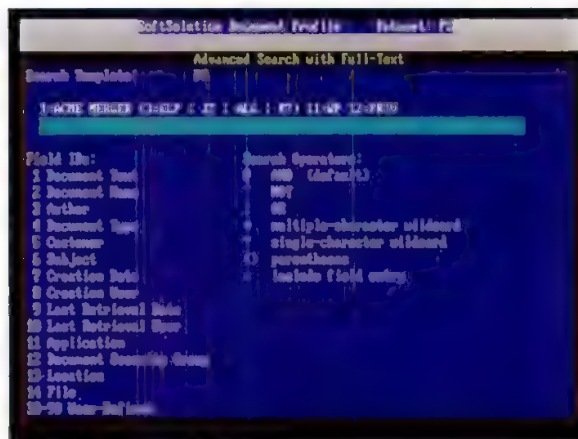
There are two methods of searching for documents. If a profile-only search will yield what you need, you can fill in the criteria on a blank profile screen and hit F7. Also available are more-advanced searches using operators on a two-line input field, encompassing full text, profiles, and user-defined fields. The default search covers your own file server, but you can change the scope to include multiple servers, multiple LANs, and the whole wide area network.

Certain restrictions apply, however. The current version of *SoftSolution* does not let you search for dates any more specific than month/year. The system stores all dates and makes them available for writing reports, but it will change a search for, say, all files created between 1-Oct-91 and 4-Oct-91 to all files between Oct-91 and Oct-91.

WORDPERFECT INTEGRATION

The product is integrated with *WordPerfect*. A utility lets you remap many *WordPerfect* function keys for saving, renaming, and listing files. The product also provides a native file viewer for *WordPerfect* and makes it impossible for users to shell to DOS from that program or from *SoftSolution* itself.

An undocumented feature also lets the administrator prevent users from shelling to DOS from other applications. But as with some other products we reviewed, *SoftSolution*'s security measures could be improved. For instance, the product does not catch documents created under an application's second window. (A new feature, expected by the time you read this, will force the profiling of new files



created when opening *WordPerfect*'s second window.) *SoftSolution* is best suited for an environment where users have no opportunity to explore each application's windowing capabilities. Users can also invoke many programs' Save As functions to create new, unprofiled files to their hearts' content.

Activity-logging features could be more complete. While the program logs some information pertinent to documents themselves, such as the number of accesses, time spent editing, and keystrokes per document, it does not account for viewings, document deletions, or print time. Like other packages we saw, *SoftSolution* does not log system accesses or failed password attempts. It also does not log the time and date of accesses and tasks performed.

FLEXIBLE REPORTING FEATURES

SoftSolution's flexible report writer offers up to 4 sort fields and up to 12 included fields, all of which can be totaled for analytical or billing purposes. Report types are a function of selected report files; each one, such as Billing, Security, or Users, allows a different set of pertinent fields you can include.

One limitation of the program is that any file archiving and block deletions require completing a report definition screen. Files archived or deleted must have "expired" according to the document life you have specified during setup. Otherwise, you will find yourself resetting the document life, waiting until expiration, or exiting to DOS to change the system date—a monkey wrench in the spokes of true version control. You can, however, perform full-text searches of archived documents.

SoftSolution Global lets you embed as many as 70 user-defined searchable fields in any document; it also provides a set of predefined fields for your document profiles. You can search for documents by profile only, or perform more advanced searches by filling in Boolean operators and wildcards on an input field that can encompass full text, profiles, and user-defined fields.

New features in Version 3.0, expected to ship in January, include network independence across wide area networks and the availability of 14 more user-defined fields. A separate product, *Intelligent Search*, will allow advanced searches by proximity, phonetic spellings, and other criteria; it should be available by the time you read this. The manufacturer also plans to launch a Windows-based version of *SoftSolution* next year.

The company offers free but not toll-free support weekdays from 7:00 to 6:00 M.S.T. Users can purchase the optional Elite support, a service that provides them with 24-hour, 7-day support at a toll number, among other benefits.

With the addition of a per-server fee to the per-workstation cost of the program, *SoftSolution* certainly does not rank as the least expensive of these products. The inclusion of an API, however, means that it offers a degree of customizability not available with the other products we saw. Top-notch security requires careful handling of user rights, programming through the API, and an enforced version-control policy to come up with what works best for your network without crippling its efficiency. Once you have these things, you will find *SoftSolution Global* a feature-rich tool for managing your network's data files. ■

Gary Berline is a consultant living in New York City and a frequent contributor to PC Magazine. Wendy Dugas Pérez is a frequent contributor to PC Magazine. Ed Perratore is a free-lance writer and a frequent contributor to PC Magazine. Joe Salemi is the author of PC Magazine's Advisor column, and a sysop on ZiffNet.



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CIRCLE 304 ON READER SERVICE CARD

Creating organizational charts can be a time-consuming chore—or an easy job. It all depends on whether you pick the right tool.



ILLUSTRATION: DOUG ARCHER

Five Programs That Can Make Sense Out Of Any Organization

by *Christopher Barr*

Preparing organizational charts is not at the top of anyone's to-do list. Mention that you're working on one and your coworkers are likely to chuckle. These visual representations of a company's structure, however, are valuable—for some firms, in fact, a necessary evil of corporate life.

ORG PLUS FOR WINDOWS

by Christopher Barr

Banner Blue Software, maker of the popular DOS-based chart program *Org Plus Advanced*, has announced a *Microsoft Windows* version that should be on the market by the time this issue goes to press. From the looks of a preliminary version, we feel sure the *Windows*-based version will duplicate the success of the DOS version.

In *Org Plus for Windows*, you create a chart by adding boxes on-screen and picking the style from the on-screen tool box. You can add managers, subordinates, coworkers (to the left or the right), and assistants. *Org Plus for Windows* even allows you to include comanagers, a feature no other program offers.

Like the DOS version, *Org Plus for Windows* can be customized in many ways. It has 16 different chart styles, 8 staff and assistant styles, and more than enough border, line, and shadow options to suit the most creative chart maker. Text can be scaled to fit in boxes of any size.

The DOS version's best feature is the Make Fit command, which shrinks your chart to fit on one printed page. *Org Plus for Windows* wisely includes this feature.

Although many features promised in *Org Plus for Windows* were not included in the preliminary version we saw, Banner Blue promises that users will be able to share files between the DOS and *Windows* versions. ■

Perhaps putting org charts together is an unpopular task because it is so difficult to prepare them correctly. There are many job titles to keep track of, and their relationships to other positions must be properly thought out and charted. Connecting two job titles with the wrong line can be an embarrassing, costly mistake.

Without good software to make the right connections, you are forced to construct your company's hierarchy in your head before you start. When a good org chart program is not available, many people seize the tool closest at hand, such as a word processor like *WordPerfect*, with its box-drawing feature, or a presentation graphics program like *Harvard Graphics*. A good org charting program does have text editing and presentation features, but it also has some database characteristics, which simplify the job of tracking people and their titles.

In this roundup, we evaluate five org charting programs ranging in price from \$29.95 to \$195: Unison World Software's *Chain of Command*, Power Up Software Corp.'s *Company Ladder*, BLOC Publishing Corp.'s *Corporate Ladder*, Roykore's *Instant ORGcharting!*, and Banner Blue Software's *Org Plus Advanced*. These products vary widely in their levels of sophistication and in the options they offer. And because an org chart is a visual representation of a

company's structure, you won't want to sacrifice the best printing options for ease of use.

Since many types of programs let you create org charts, we limited our roundup to products that are dedicated exclusively to organizational charts. Flowchart programs such as *allCLEAR*, from Clear Software, and *ABC Flowcharter*, from Roykore, can create organizational charts in addition to relatively complex flowcharts. But flowchart programs tend to be

When a good org chart program isn't available, many people seize the nearest tool, such as a word processor or a presentations graphics program.

more difficult to master than org charting programs, and they often require that you learn complex routines. They also don't display titles and names as the default key fields the way all org chart programs do.

Org chart programs contain presentation features ranging from simple box drawing to color coding of different organizational branches. Some programs can perform mathematical calculations, so you can assign salaries to positions and calculate the total salary expenditures. Most let you hide particular fields—salary amounts, for example. Some let you fit only a few lines of text into each position's cell, while others can display numbers, text, and pictures.

In choosing the packages reviewed here, we required support for dot matrix printers as a minimum; we also tested Hewlett-Packard LaserJet II support and checked to see which packages offered



EDITORS' CHOICE

- *Instant ORGcharting!*
- *Org Plus Advanced*

Two of the programs reviewed here stand out for their features as well as their ease of use. Roykore's *Instant ORGcharting!* lets *Microsoft Windows* users create beautiful charts with just a few clicks of the mouse—a welcome relief from programs that require tedious box and line drawing. It is also the most powerful package, letting you build charts that are larger and more detailed than the other programs in this roundup. And it is the only product that offers color and box

patterns as options.

DOS users will be well served by *Org Plus Advanced*, Version 6.0. This venerable character-based program has been around for years, and Banner Blue Software wrote the book on features. *Org Plus* pioneered the Make Fit option that enables large diagrams to fit on a single page. No other package offers as many mathematical functions. *Org Plus* makes organizational charting under DOS as easy as it's going to get.



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GRAPHICS

ORG CHARTS

toward a product that will help you generate a coherent picture, provide some insight into your organization's structure, and get the job done quickly.

Chain of Command



runs in graphics mode. Using a proprietary interface, *Chain of Command* lets you add positions by clicking boxes on the screen. Subordinate and assistant boxes can be added by clicking on the box of a superior and then selecting the command Add a Position. A dialog box opens to accept up to four lines of text; each line can hold 31 text characters.

After we drew the chart, we attempted to print it. Some of the programs were unable to print all 70 positions legibly on a single page. Among the findings: None of the packages reviewed could automatically depict a comanaged (shared) employee.

The five reviews that follow should steer you

File Edit Print Add Chart Graphics Database Setup

c:\NCR\Invest1.chm

Mike Red
North Region Sales Manager

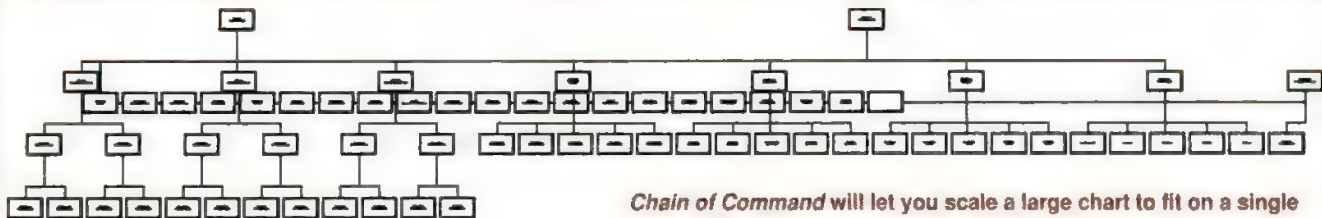
George Bush
President

Barney Woods
Administrative Assistant

Jay Dandforth
Vice President - Finance

Rick Vandell
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Dis



Unison World Software, 1321 Harbor Bay Pkwy., Alameda, CA 94501; 415-748-6670. **List Price:** \$150.

In Short: *Chain of Command* is a limited program that makes it difficult to see the entire chart. The program's best asset is its ability to add .PCX graphics to the chart.

ries. Although it operates in VGA mode, the only color configuration available is monotonous black text on a white background.

When scrolling the chart, *Chain of Command* does not repaint the screen to reflect boxes that had been outside the screen borders; it waits until you have stopped scrolling. If you have added too many boxes, it wraps some boxes on top of others, and you will have no way of straightening out the mess.

You will not run into problems if you keep your chart under one page, but you can easily lose your perspective when viewing a large chart. There are two options for viewing: normal and full. If you are in full-view mode in a large chart and you select a position away from the top box, you can easily lose your place. And if you use the Undo command, you are always returned to the top of the chart, no matter where you were before you selected it.

Curiously, there is no drawing mode, although the program runs in graphics mode. You can draw a box or connect two

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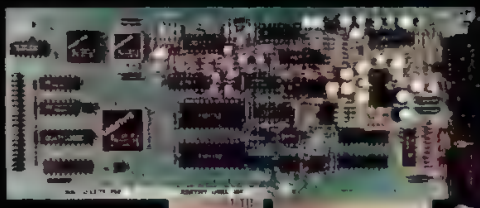
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COMPUTE August 1991

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The built-in mixer makes the Sound Blaster Pro fully compliant with Microsoft's Multimedia Level 1 Extensions to Windows. Multimedia software will be able to fade-in, fade-out and pan the various audio sources to create elaborate sound montages.

The Sound Blaster Pro includes a CD-ROM interface for either an internal or external CD-ROM player. There's also an internal connector for CD-Audio. The MIDI interface is compatible with the original Sound Blaster's MIDI interface but adds the MIDI time-stamp that's part of Microsoft's new multimedia standard.

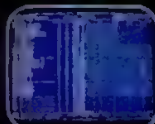
All in all, the Sound Blaster Pro is chock-full of new features, yet it's fully compatible with its younger brother."

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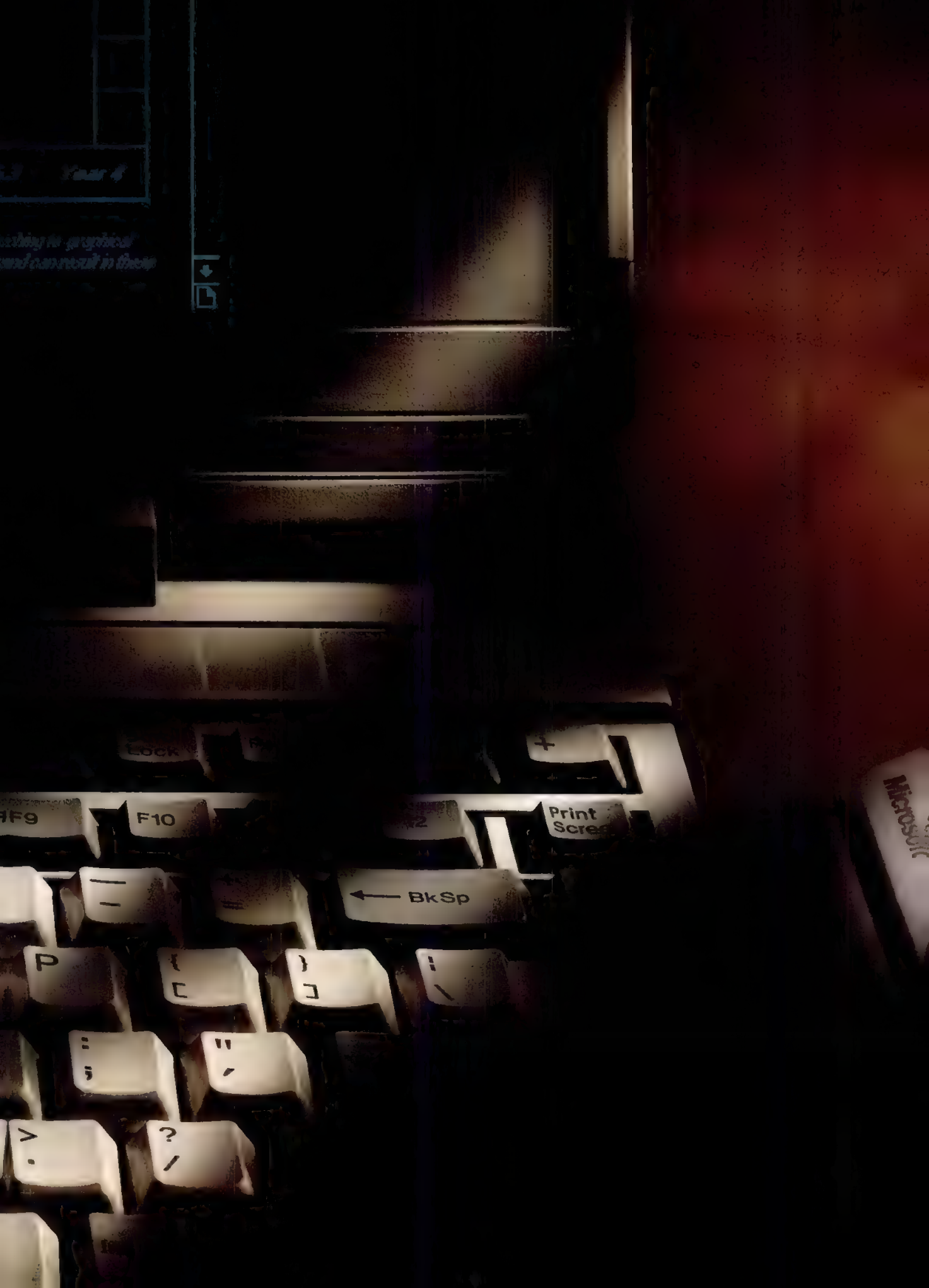
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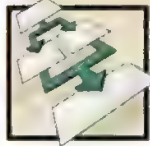
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Company Ladder can create huge charts with more than 2,000 positions, up to 255 levels, and 999 subordinates per level, but it has trouble printing them.

Company Ladder



Company Ladder, from Power Up Software Corp., has many features that make creating an org chart fast and easy. It can handle

many input fields and even performs calculations on fields. It can create huge charts with more than 2,000 positions, up to 255 levels, and 999 subordinates per level, but it has trouble printing them.

No other org chart program can get you started as quickly as *Company Ladder* (\$79.95). At the top of the split screen, you enter data into the Personnel Input field and view a representation of your chart that appears automatically in the lower window. Press Alt-V for view mode and *Company Ladder* draws the boxes and lines.

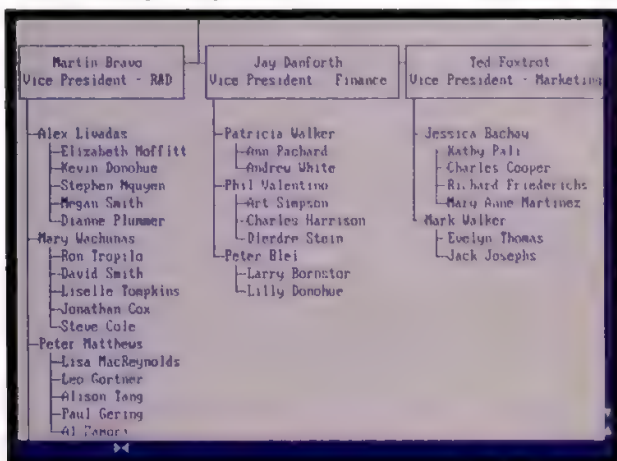
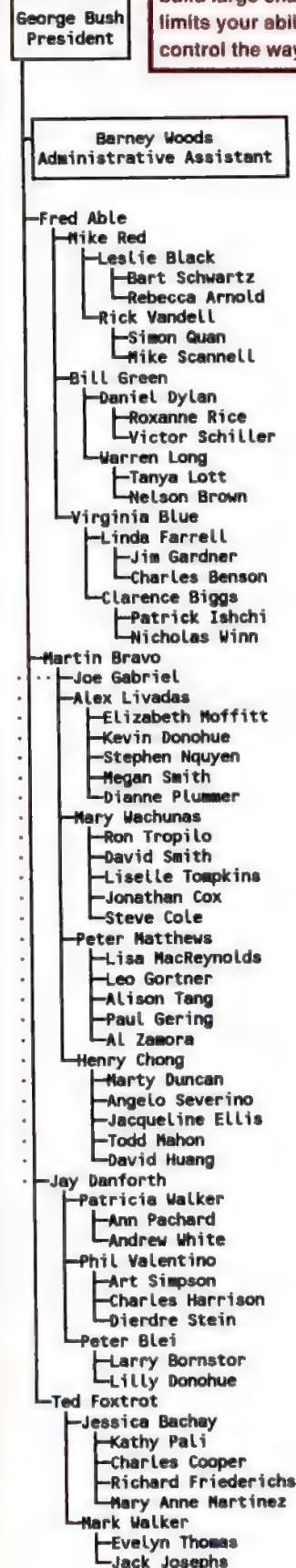
This program has 26 input fields—more than any other DOS package we reviewed. Each field can hold up to 255 text characters, or you can designate any of the fields as number or money fields and perform calculations on the numbers. You can specify where to position totals; for example, you can place salary totals in the president's position or have each department's budget appear in the manager's box. *Company Ladder* has functions to sum, to count, and to calculate the minimum, maximum, and mean of a range.

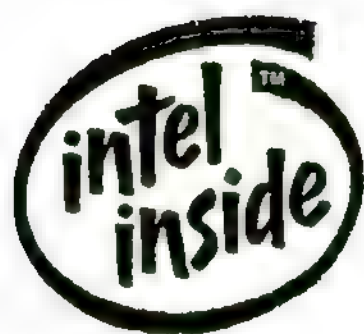
On the downside, you must enter all the information manually. *Company Ladder* does not allow you to import or export data. The program even lacks a reporting option that would print the contents of the fields.

After you have entered the names and numbers for your chart, *Company Ladder* presents a full-screen graphical representation

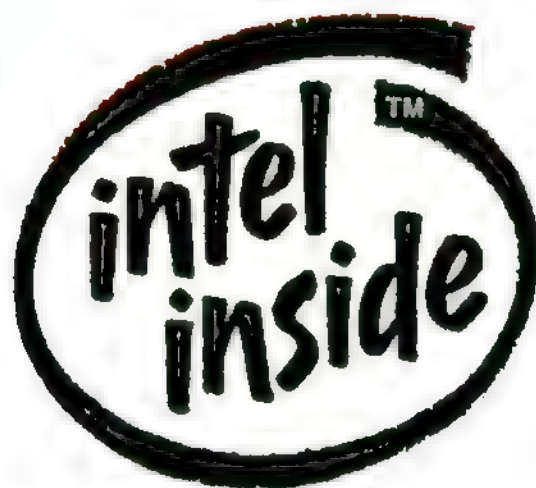
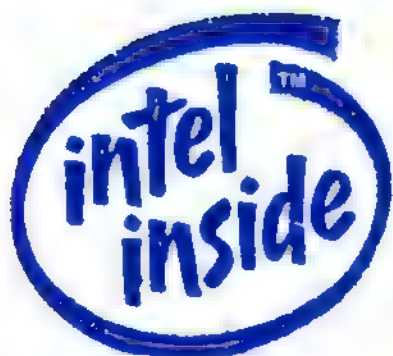
You can enter up to six lines of titles into a *Company Ladder* chart, but you cannot control their placement.

Company Ladder lets you build large charts but limits your ability to control the way they print.





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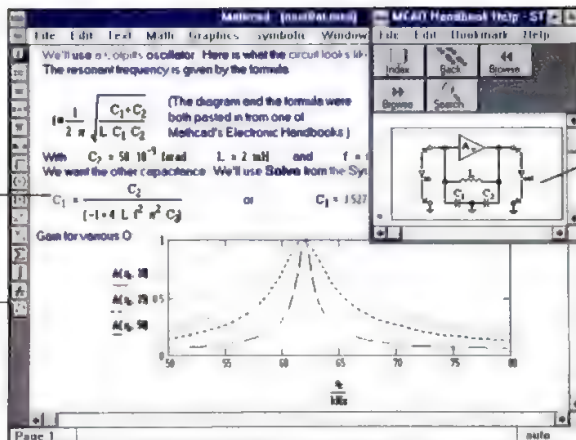
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Mathcad 2.5
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Best of '88
Best of '87



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PCM 92

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with your current position highlighted. The package has six different box styles, including shadows and broken lines, and there are seven chart styles to choose from, including both staggered and boxed lists. In view mode, you must use the cursor keys to navigate through the chart, because *Company Ladder* lacks mouse support.

There is no drawing mode, so you cannot move a box to a better position by dragging it. You can connect boxes by drawing auxiliary lines, but you draw lines and move positions by choosing the names from a scroll list.

You can enter up to six lines of titles into your chart, although you have no control over where they are placed. All six lines will always print in the top center of the chart.

If you have created a large chart, you will begin to encounter problems when printing. Although it does indicate page breaks in the View screen, *Company Ladder* does not let you know how large your chart is; therefore, you cannot adjust the chart's position to make it fit on a page, and you will not know whether you've chosen the correct printer options. As a result, you are likely to waste time and paper experimenting for the best combination.

Company Ladder will take advantage of your printer's fonts, but it does not support PostScript printers. It supports most dot matrix printers and has additional support for the HP ColorPro and HP 7550 plotter.

Despite its many powerful features,



Company Ladder

Power Up Software Corp., 2929 Campus Dr., San Mateo, CA 94403; 415-345-5900.

List Price: \$79.95.

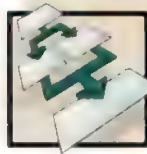
Requires: 384K RAM, DOS 2.0 or later. Hard disk recommended.

In Short: *Company Ladder* lets you create an impressive chart but makes printing more difficult than it needs to be.

CIRCLE 410 ON READER SERVICE CARD

GRAPHICS ORG CHARTS

Company Ladder is ultimately disappointing. There is no way to access all those fields, and even printing is tougher than it should be. If you deal only with small one-page charts, *Company Ladder* may be for you, but if you need to print large multi-page org charts, go with a program that provides better printer support.



see an on-screen marker that looks like a mouse cursor marker, but—surprise!—

Corporate Ladder

BLOC Publishing Corp.'s *Corporate Ladder* operates in text mode to help you create an org chart. When you load it, you'll



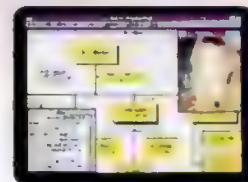
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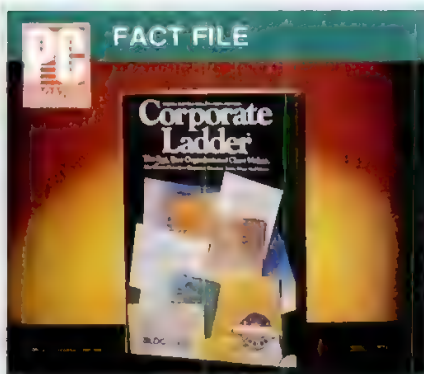
Copyright © 1991 ATI Technologies. Trademarks are registered by their respective companies. *Suggested retail price, dealers may sell for less.

When you load
Corporate Ladder
you'll see a marker
that looks like a
mouse cursor, but—
surprise!—there's no
mouse support.

there's no mouse support in the program.

You begin creating a chart by moving the cursor to any area of the screen and then typing the first entry. Press Enter to begin a new line and the cursor will be placed under the first character of the first line. When you finish making an entry, press F3 and a box is drawn around the text. Go to another spot and enter more text, then press F3 again. That's the pattern: Enter text, then draw a box around it. Imagine how long that takes for a 50-position chart, or even a 25-position chart.

This program does not offer many options. *Corporate Ladder* can draw either fixed-length or variable-length boxes to surround the text. Each box can have up to 80 characters of text and up to 25 lines.



Corporate Ladder

BLOC Publishing Corp., 800 S.W. 37th Ave.,
#765, Coral Gables, FL 33134; 305-445-0903.
List Price: \$29.95.

Requires: 512K RAM, CGA graphics adapter
or better, DOS 2.x or later. Hard disk
recommended.

In Short: Small charts are very easy to create
with *Corporate Ladder*, but large charts will
require a lot of repetitive work.

CIRCLE 411 ON READER SERVICE CARD

GRAPHICS ORG CHARTS

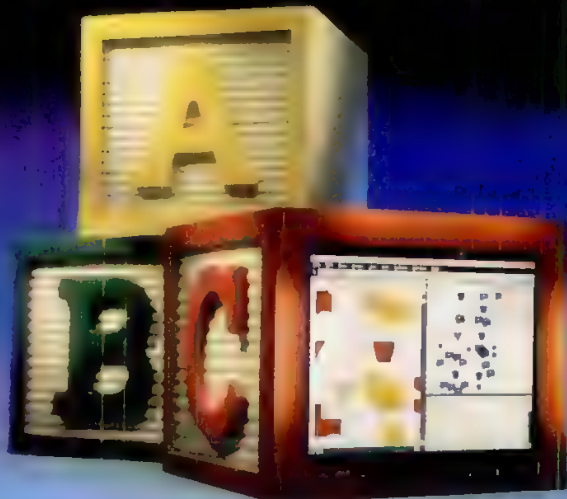
There are only three different box styles and a few line styles to choose from, but you can drop in extended ASCII characters if you feel brave.

When you have finished typing in positions, you connect the boxes manually by drawing lines between them. You do not have to be totally accurate in your

drawing, because *Corporate Ladder* has a cleanup feature that will move boxes until they have been centered and adjust lines until they have been made even. We encountered several problems with the cleanup feature and had to smooth the boxes and lines manually before printing.

Corporate Ladder supports HP Laser-Jets, Epson and IBM dot matrix printers, and Okidata daisy wheel printers. It can

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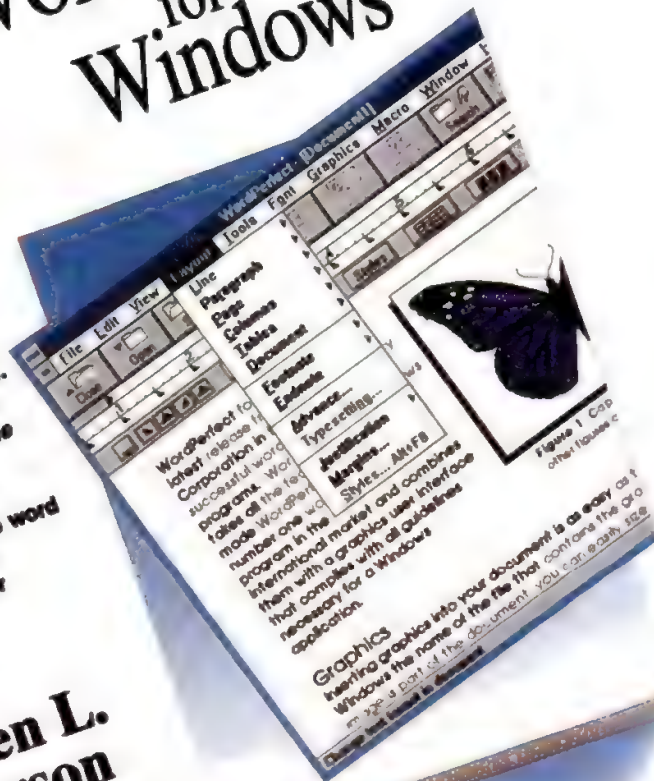
CIRCLE 124 ON READER SERVICE CARD



Guide To WordPerfect[®] for Windows

■ Thousands of users have mastered WordPerfect with the help of best-selling author Karen Acerson. Now, Acerson teams up with PC Magazine to bring you this premier guide to high-performance word processing with WordPerfect for Windows.

by
**Karen L.
Acerson**



Suggested retail
price is only \$27.95

"There is nobody I can think of that I would consider more qualified to write a book about WordPerfect than Karen. In fact, if I wanted someone to teach me all the in's and out's of WordPerfect, I would turn to Karen. She really knows what she is talking about."

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Karen Acerson shows you how to master WordPerfect for Windows quickly and easily. Clear, simple instructions are illustrated with hundreds of examples drawn from her experience as a WordPerfect Corporation customer support manager and as a consultant.

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Nationally recognized WordPerfect expert Karen Acerson will show you in a clear, easy-to-understand way how to:

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- Customize WordPerfect for Windows and your keyboard
- Learn the basics of Windows—even if you've never used it



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CIRCLE 531 ON READER SERVICE CARD

Fortunately, *Corporate Ladder* posts an error message if your chart will not fit on one page. To fix the problem, you will need to switch to smaller print.

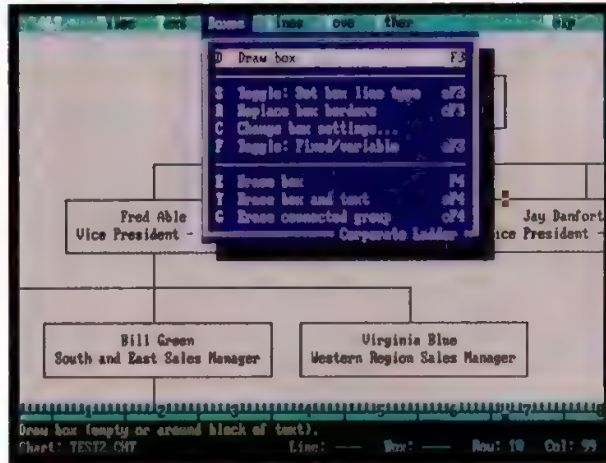
use a LaserJet's internal fonts; it also supplies four Gothic and two Courier software fonts on-disk that can be downloaded to your printer when you print a chart, if you have enough memory in the printer.

GRAPHICS ORG CHARTS

You can add titles—up to four in any corner or centered at the top—and the date can be inserted at the bottom center. Then you are ready for print preview. Fortunately, *Corporate Ladder* posts an error

message if your chart will not fit on one page. To fix the problem, you will need to switch to smaller print.

Corporate Ladder is basically a glorified box-drawing program. The soft fonts make it very easy to print what you have created. If all you need is an occasional organizational chart maker, then at \$29.95, *Corporate Ladder* is a real



***Corporate Ladder* is great for drawing boxes, but connecting all of the titles individually is a tedious process.**



ORGANIZATIONAL CHARTS: SUMMARY OF FEATURES

Products listed in alphabetical order

	Chain of Command	Company Ladder	Corporate Ladder	Instant ORGcharting!	Org Plus Advanced
List price	\$150.00	\$79.95	\$29.95	\$195.00	\$99.99
DATABASE CHARACTERISTICS					
Maximum number of fields per job title	4	26	25	64	24
Maximum number of characters per field	31	255	80	256	25
Displays pictures in a field	☒	☐	☐	☒	☐
Suppresses printing of a field	☐	☒	☒	☒	☒
Adds notes to a field	☐	☐	☐	☒	☐
Includes mathematical functions	☐	☒	☐	☐	☒
CHART CHARACTERISTICS					
Maximum chart size	6 pages	2,000 positions	43 x 25 inches	100 x 100 inches	500 positions
Number of chart styles	1	7	1	9	7
Maximum positions per chart	16	255	Unlimited	Unlimited	99
Number of box styles	6	6	3	18	8
Adds patterns to boxes	☐	☐	☐	☒	☐
Includes drawing capabilities	☐	☐	☒	☒	☒
Allows choice of arrows	☐	☐	☐	☒	☒
Adds color	☐	☐	☐	☒	☐
PRINTERS SUPPORTED					
Dot matrix printers	☒	☒	☒	☒	☒
HP LaserJet series	☒	☒	☒	☒	☒
PostScript printers	☒	☐	☐	☒	☒
Plotters	☐	☒	☐	☒	☒
PRINTING OPTIONS					
Make Fit command	☒	☐	☐	☐	☒
Additional fonts	☒	☒	☒	☐	☒
FILE FORMATS					
Imports	None	None	ASCII	ASCII	ASCII, Harvard Graphics
Exports	None	None	ASCII	ASCII, Windows Metafile	ASCII, Harvard Graphics, TIFF

PC —Editors' Choice

☒—Yes

☐—No



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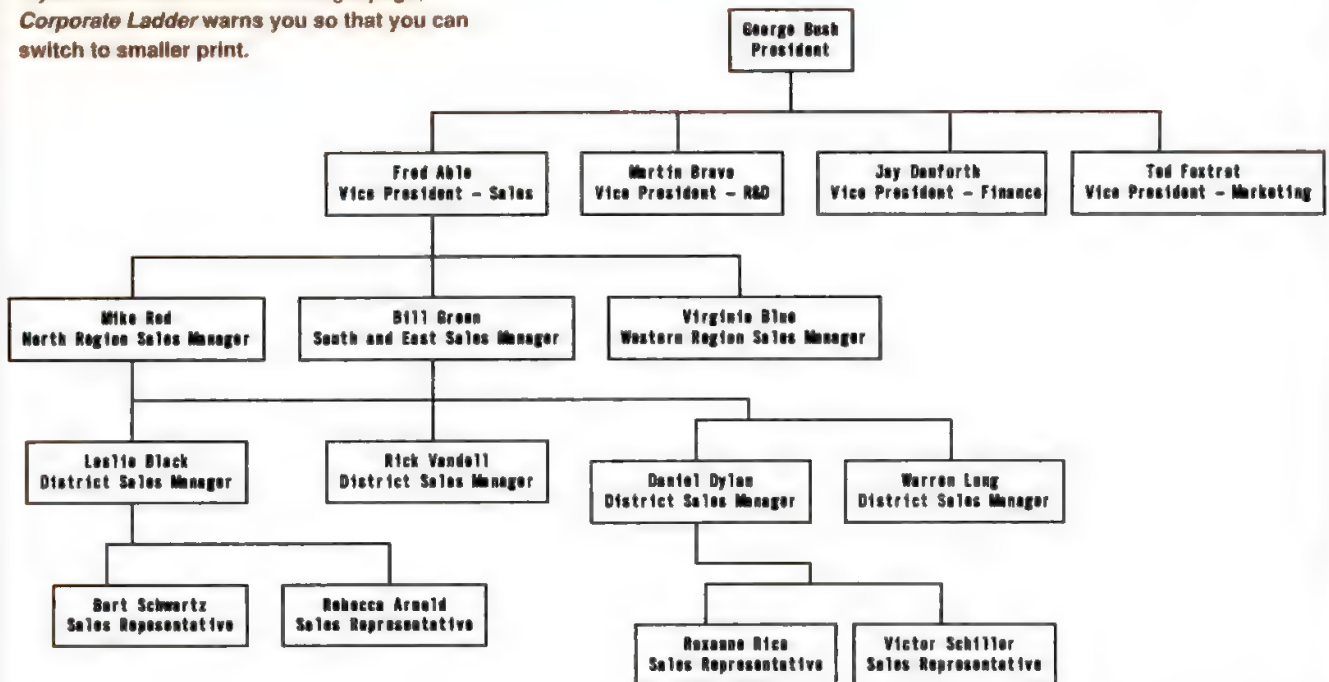


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CIRCLE 245 ON READER SERVICE CARD

GRAPHICS ORG CHARTS

If your chart will not fit on a single page,
Corporate Ladder warns you so that you can
switch to smaller print.



bargain. If your work demands large charts and more flexibility, however, opt for a more powerful package.

Instant ORGcharting!



Roykore's *Instant ORGcharting!* is the only Microsoft Windows-based product we tested, and as expected, it has the great-

est hardware requirements: 1MB of RAM and 1MB of disk space. And at \$195, it is also the most expensive package.

Unlike the DOS-based programs in this roundup, *Instant ORGcharting!* lets you benefit from Windows' color and printer support. What's more, the tutorial manual will have you creating an org chart 5 minutes after installation.

Instant ORGcharting! starts with a single top box, and from there you have two ways to construct a chart: You can add each position individually by pressing the add-a-box icons, or use the Spacebar in combination with the icons to erect a skeleton chart. If you select the single-box method, you enter the text as you go, but if you build the structure first, you will have to return and fill in the blanks.

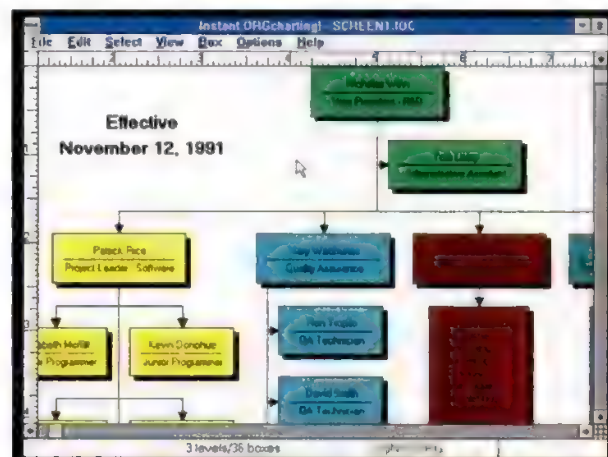
The box on the first level has two push-button icons, one to add an assistant and the other to add a subordinate. Each subsequent level has five add-a-box icons surrounding each box. Press above to add another manager; press below to add a subordinate or an assistant. You can add a coworker to either side, and you can add an assistant or another subordinate below. Each manager position has a sixth icon that will allow you to add a midlevel manager.

You add position information via a dialog box. Each box can have up to 64 fields of textual information, and each

field can be up to 256 characters in length. *Instant ORGcharting!* gives you the option of hiding an unlimited number of fields from on-screen view. When you arrange the fields, you can choose to have the text print above and below the box, and you can center or justify it. If you want to separate fields—a name from a title, for example—simply drag a separator icon between the fields. The package lacks a numbers field that would let you enter amounts for calculation.

You can assign text attributes to an individual box or a group of boxes. The default printer font is 8-point Helvetica

if you have an Epson, HP LaserJet II, or PostScript printer emulation. *Instant ORGcharting!* does not ship with screen



Instant ORGcharting! automatically generates properly proportioned boxes and lines, and gives you the ability to fine-tune them.

NEIL EVANS

Microsoft, MIS General Manager

Products: LAN Manager 2.0, SQL Server 1.1, Windows 3.0

Servers installed: 532 PCs, 10 VAX, 2 AS400

Workstations: 20,000 Windows workstations worldwide

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In 1986, it became clear to Neil and his group that there were too many limitations with the minicomputer system they were using.

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Another limitation was that the minicomputer system was too inflexible. Which meant changes were always slow and costly.

So Neil's group decided to migrate their network to Microsoft's client-server solution.

Microsoft LAN Manager and Microsoft SQL Server were integrated into the system and the Windows® environment was used on the front end.

On this platform, Neil and his group implemented 15 major client-server applications, includ-

ing systems tracking worldwide sales and management expenses. The benefits became apparent right away. LAN Manager and SQL Server are optimized to work with Windows, so individual PC stations are more completely integrated into the MIS system. It is now much easier for users to share information. People can do their jobs more efficiently. And there is much better management reporting for executive decision making.

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Microsoft®

GRAPHICS ORG CHARTS

fonts, so you will need a screen font generator like *Adobe Type Manager* to get true WYSIWYG.

Two floating fields take advantage of the *Windows* environment: *Notes* and *Pictures*. *Notes* allows you to attach textual information to each box. You cannot import data to the *Notes* field, but you can use the Clipboard or type in data. The *Pictures* feature lets you add a .BMP file, which could be an employee's picture or a rendering of a stock item, for example. Either the *Notes* or *Picture* field can be selected and displayed.

Unlike character-based chart-making programs, *Instant ORGcharting!* lets you enhance each box by adding colors and patterns to the fills and shadows. You have the option of coloring a single box or any combination of branches or workgroups. To connect the boxes you can choose among five line styles with varying thickness and color, and you can

Most of the drawing and sizing is done for you automatically, but *Instant ORGcharting!* lets you customize your chart with manual drawing tools.

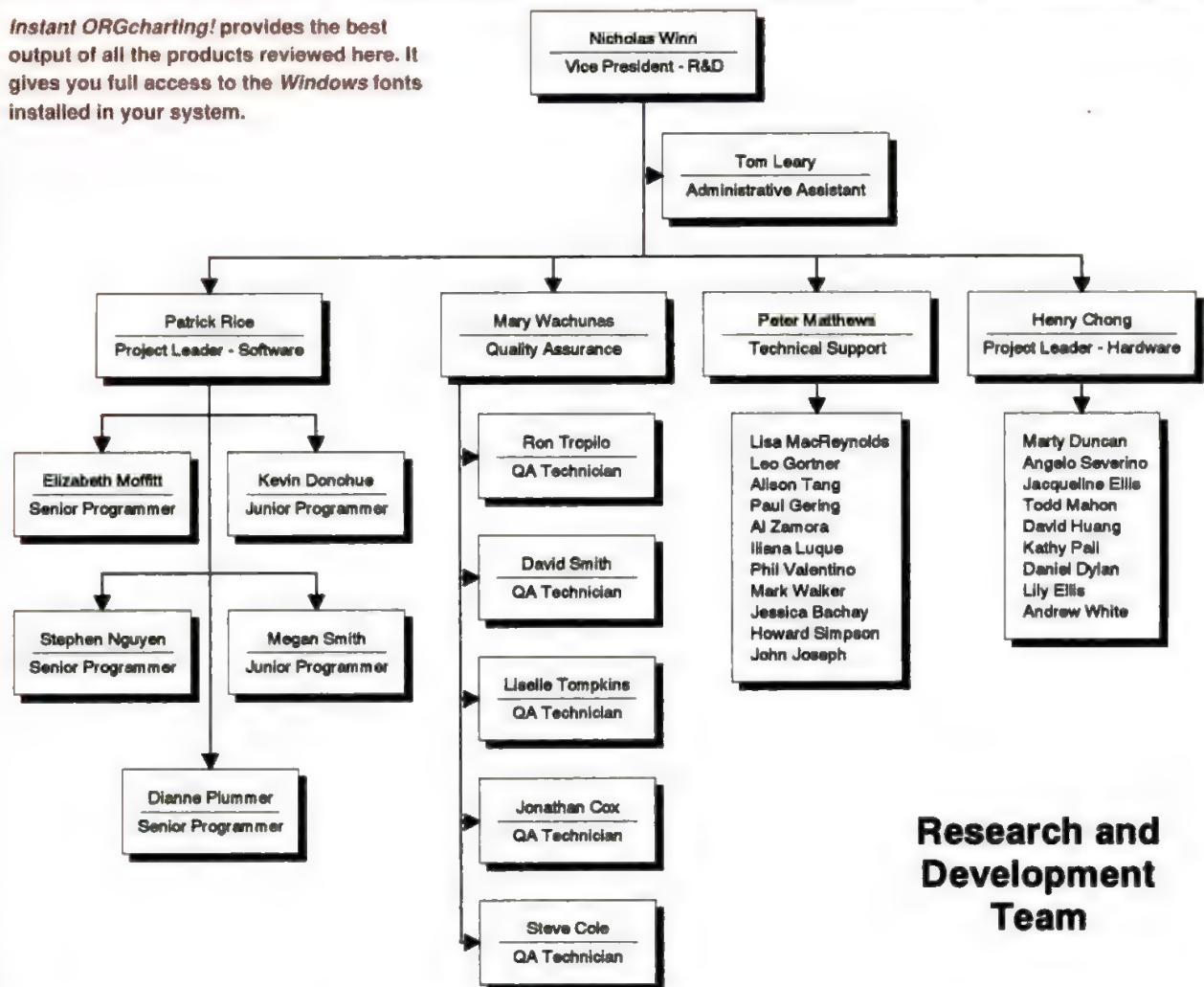
have seven different types of arrows pointing to or from each box. When modifying the positions, you can choose a single box or any combination—anything from a

single branch or workgroup to a large domain like all assistants, all managers, or all nonmanagers. You cannot, however, change the rectangular shape of the box.

Most of the drawing and sizing is done for you automatically, but *Instant ORGcharting!* lets you customize your chart with manual drawing tools. You can draw boxes, resize a single box or a group of boxes, draw connecting lines between any two boxes, and add text to the chart. Text is added anywhere in the chart but is not anchored, so if the chart is appended or moved, the text can be overwritten.

Instant ORGcharting! has manual drawing tools to assist you with the functions it cannot perform automatically. For instance, you have to use the drawing tools to create a shared-employee relationship, or to move a box to a different spot. The problem with manual operation is that any changes instituted with the manual drawing tools can be lost when the

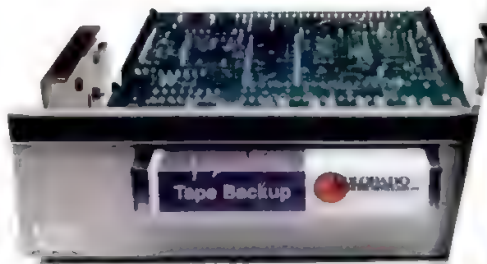
Instant ORGcharting! provides the best output of all the products reviewed here. It gives you full access to the *Windows* fonts installed in your system.



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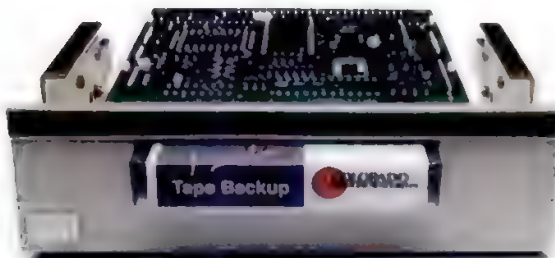


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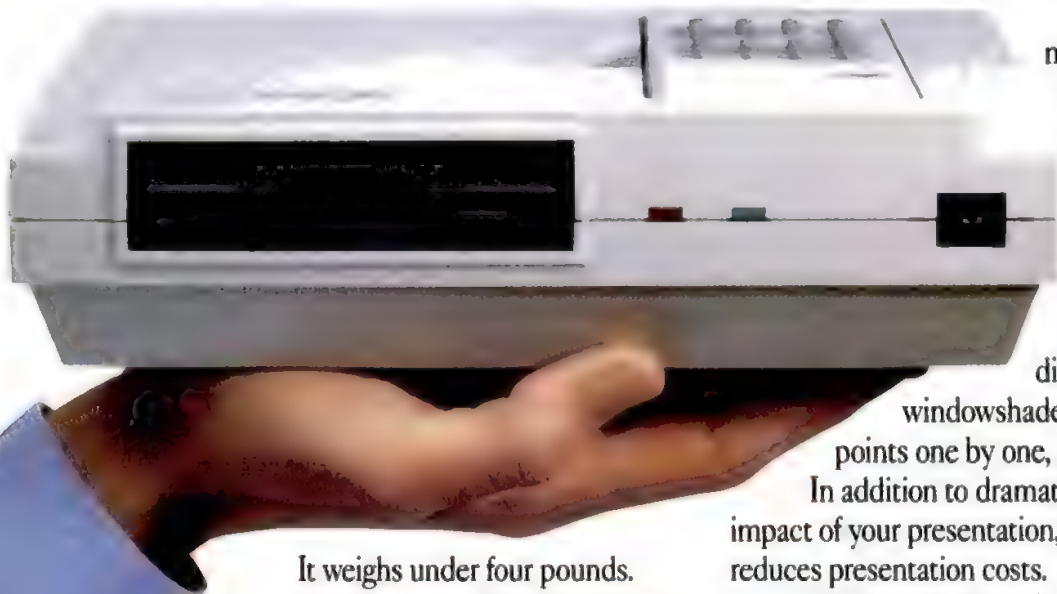
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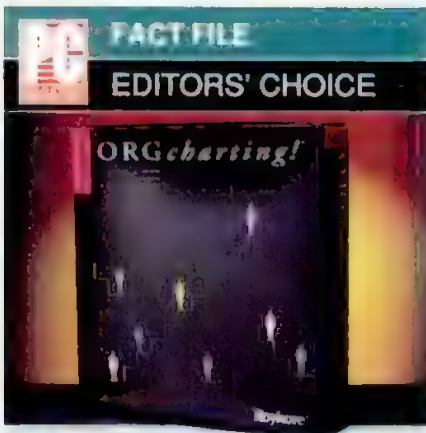
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CIRCLE 272 ON READER SERVICE CARD



Instant ORGcharting!

Roykore Inc., 2215 Filbert St., San Francisco, CA 94123; 800-227-0847, 415-563-9175.

List Price: \$195

Requires: 1MB RAM, hard disk, Microsoft Windows 3.0, mouse.

In Short: With the help of the Windows interface, *Instant ORGcharting!* makes creating charts easy, automates many tasks that other programs make you perform repeatedly, and provides plenty of customization options.

CIRCLE 412 ON READER SERVICE CARD

GRAPHICS ORG CHARTS

chart is edited or redrawn.

As for visual presentation, we found *Instant ORGcharting!*'s output to be excellent but not perfect. In our testing, we uncovered a couple of insignificant bugs (which Roykore says will be fixed shortly), and the performance was sometimes sluggish.

Since org charts are used to depict company structures visually, *Windows* is the perfect interface. As the newcomer in this category, it looks as if *Instant ORGcharting!* will be around for a while.

Org Plus Advanced, Version 6.0



It is readily apparent why Banner Blue Software has been the leader in the org chart market. *Org Plus Advanced* (\$99.99) is easily

the most feature-packed program we reviewed. All the charts you create are totally configurable, and you can construct

a chart with as many as 600 positions. You can have up to 24 text files per position and 12 number fields that can be totaled. The package has support for dot matrix and laser printers, as well as for HPGL and PostScript.

Org Plus Advanced 6.0 is a significant upgrade over the earlier version. You no longer need to use outdated keyboard commands like Ctrl-Right Arrow to move to a related box, or Alt-F10 for Next. Now you can sail through the chart with a mouse and pull-down menus. Banner Blue has also added a virus checker to determine whether the executable code has been modified.

Version 6.0 is a character-based program that lets you enter information easily. To create a chart, you start with the Workgroup Display text input screen. When entering data, you can move to subordinate and coworker levels quickly. To see what you have created, go to Print Preview or transfer your chart to a drawing file for viewing.

You can have up to seven different chart styles and eight box styles. In addition to the standard one-line horizontal chart, *Org Plus* has one- or two-column

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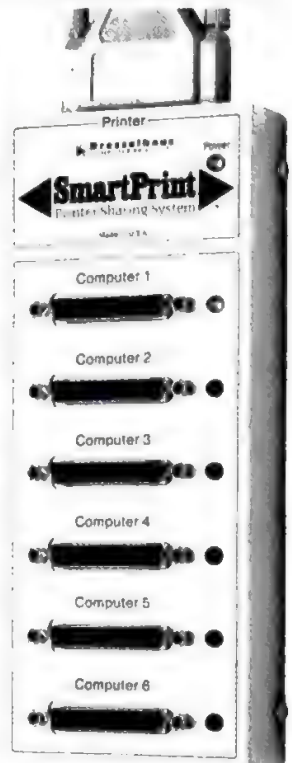
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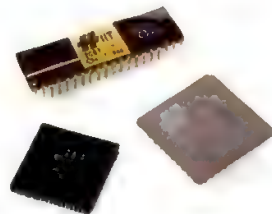
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verticals, four-column verticals, staggered charts, and open or boxed lists. You can choose the chart type when entering the information into the positions, or you can go back after building your chart to change the type for the branch or subordinates.

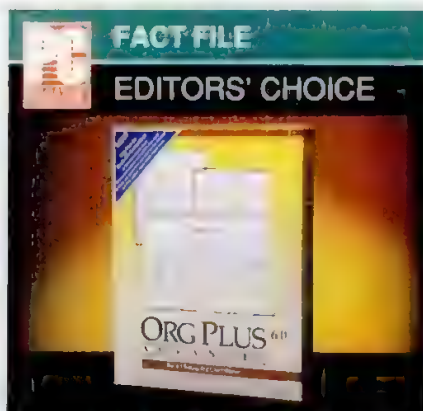
Each chart allows a maximum of 600 positions (each manager can have 100 subordinates), but that depends on the available memory, and *Org Plus* cannot use EMS or XMS. Each position has six 25-character input fields, with an additional six 15-character input fields if you need them. If that is not enough, you can add more text in drawing mode after you have constructed your chart.

Six of the number fields can be used in calculations. Whether you want to total budget numbers or consolidate salaries, *Org Plus* lets you use standard mathematical functions to perform calculations on the numeric fields. For instance, you can enter salaries into a field and have the branches consolidated under a manager's position, with a grand total at the topmost position.

In an unusual step, *Org Plus* adds title annotations to the chart when you want to print. The program allows three lines for the title and subtitles, and up to four lines of annotated text in each corner.

If *Org Plus* has not drawn the chart to your satisfaction, you can modify it in drawing mode. This creates a separate file and takes you away from the input screen. You can add to the titles and on-screen notes, too, but you have to center and place the changes manually. The tools let you mark boxes and drag them to new positions. If you need to center a shared resource, you can do it easily, then add lines as needed. Drawing mode is where

GRAPHICS ORG CHARTS



Org Plus Advanced, Version 6.0

Banner Blue Software, P.O. Box 7865,
Fremont, CA 94537; 415-794-6850

List Price: \$99.99.

Requires: 512K RAM, hard disk, DOS 3.x or later. Mouse recommended.

In Short: In its sixth version, *Org Plus* is better than the competition at just about every task.

CIRCLE 413 ON READER SERVICE CARD

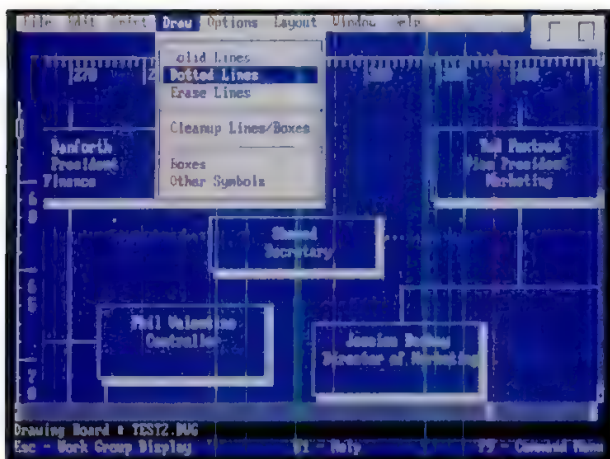
you add arrowheads and additional text or titles. When you finish drawing, moving, and adding, *Org Plus* has a terrific cleanup option that lets you smooth broken lines and boxes.

The drawback of working with a drawing file is that it is independent of the workgroup input module; you cannot change it from the input screen. Any changes that you make are purely cosmetic and do not translate back into the data files. If you modify any boxes or draw additional ones, the changes will not be visible when you return to the text input screen.

Like all the other programs reviewed in this roundup, *Org Plus* is unable to draw a box for a shared employee automatically. For example, you must manually draw a line if you want to connect one subordinate to two managers.

When you are ready to print, you will find

The superior design of the menu structure in *Org Plus Advanced* allows you to choose options as you enter data or change the appearance of the whole chart later.



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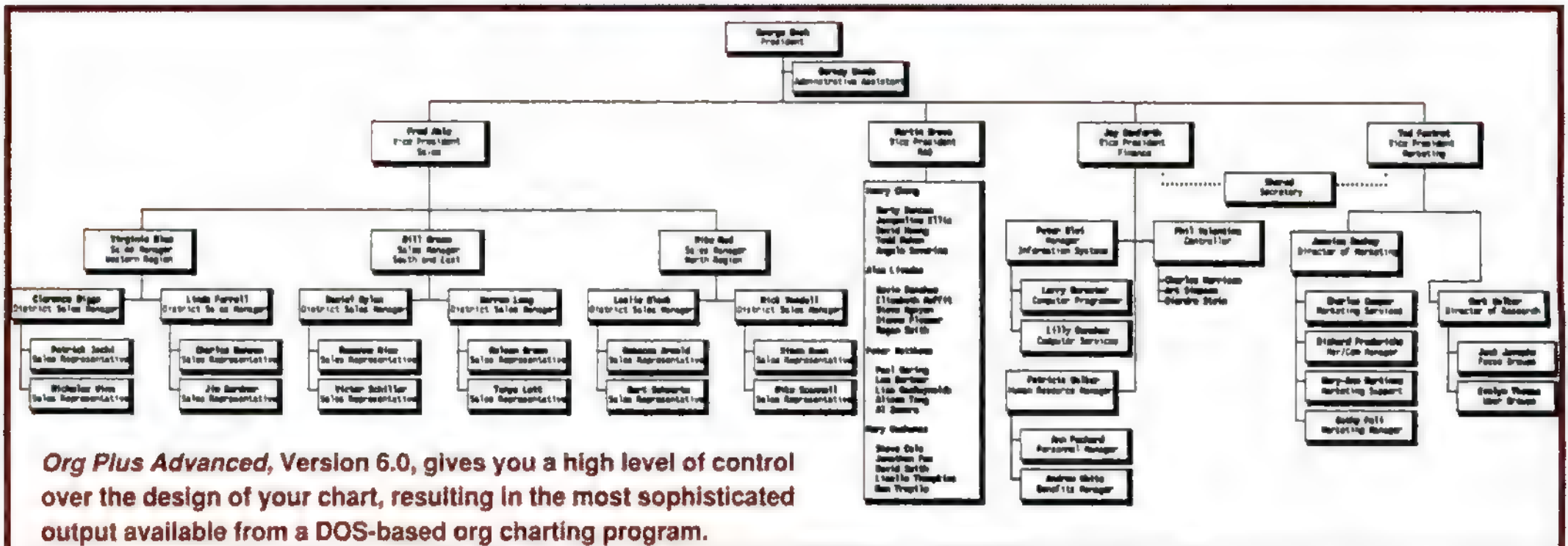
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GRAPHICS ORG CHARTS



that *Org Plus* has a few tricks and treats to offer. The major benefit is a Make Fit command that will attempt to place your entire chart on one page, regardless of the chart's dimensions. Using a soft font that comes with *Org Plus*, we were able to print a 68-position chart on one letter-size page.

Org Plus includes more than 30 fonts. The glitch: The package only estimates

the size in Print Preview. A drawing shows character counts and places a P in the border to show page breaks, but you never really know how big your chart will be until you print.

Banner Blue has designed *Org Plus* so that it works easily with other programs. You can import from and export to a *Harvard Graphics* file, various ASCII formats, or a TIFF file.

Although it's starting to show its age with its character-based interface and old command structure, Banner Blue Software's *Org Plus Advanced* is still the most versatile chart maker available, and it performs better than the competition at virtually every task.

Christopher Barr is PC Magazine's senior editor on the West Coast.

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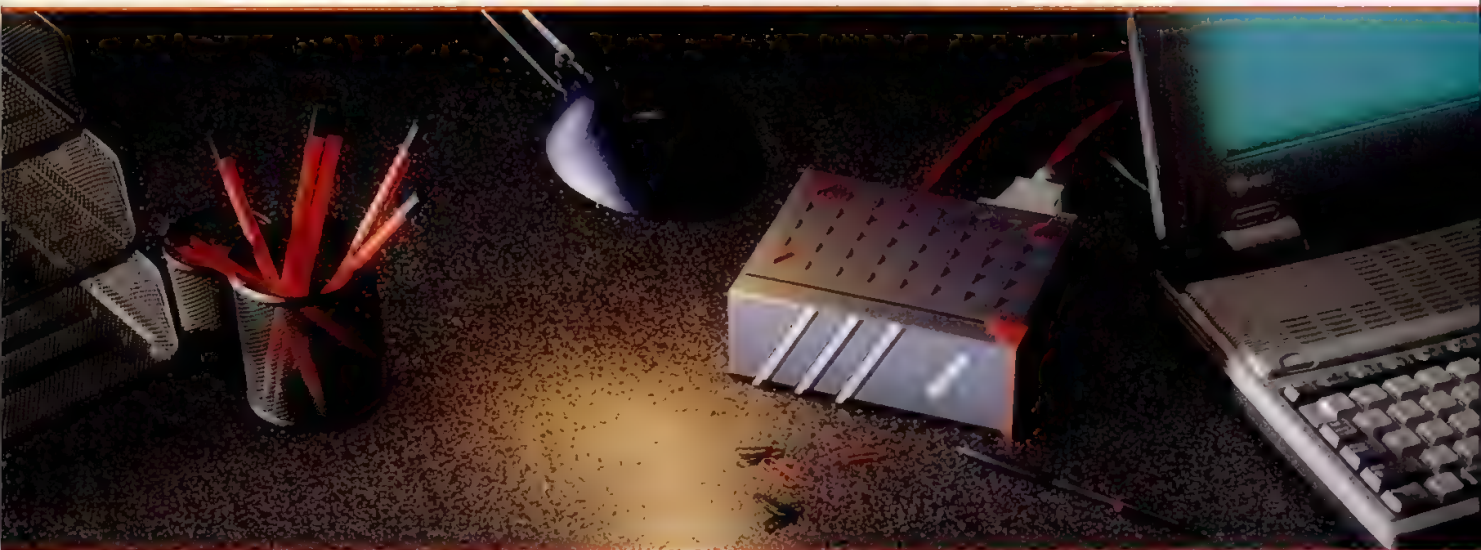
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CIRCLE 211 ON READER SERVICE CARD

by
Alfred Poor

Lab Notes

Creating an image of a family snapshot with your new scanner is often a lot easier than adding it to the letter you are writing. Even assuming that your word processor doesn't balk at the image file format, the screen image may not look right or the printed version may come out too dark, too light, or with black and white reversed.

Why should simply moving an image from one application to another and getting it to print reliably present so much trouble? Part of the answer lies in the variety of digitized images themselves. Depending on the source of the file and the type of image, you could be working with anything from a small, simple black-and-white line drawing to a large, high-resolution, true-color image that requires 24 bits of information for every pixel.

More frustrating, however, is the veritable Babel produced by incompatible file formats. Aside from the minor players, there are still at least three different bit-image formats most PC graphics applications must support: .PCX, .BMP, and .TIF.

.PCX is represented by ZSoft's *PC Paintbrush* line of programs, and .BMP is the format used by *Windows*' Paintbrush. The TIFF specification, used by .TIF files, was developed (starting in 1986) by Aldus Corp. and a group of other companies (principally scanner manufacturers) such as DEST Corp., Hewlett-Packard Co., Microsoft Corp., Microtek International, New Image Technology and Xerox Imaging Systems/Datacopy.

Of these "big three" formats, .TIF files are the most complex. So in this article we will take a look at how these files are structured.

DATA FILE FORMATS

All data files have rules that govern their structure. The rules for some are more complex than others, and in turn some formats are more flexible than others. Almost universally, however, the rules prescribe that certain standard pieces of information be placed at the front of the

Looking at the TIFF Specification From the Inside

■ The complex and subtle way TIFF stores graphics information is very different from other image formats, but it makes TIFF the choice for a wide variety of applications.

file, in a section referred to as a *header*. After the header, the actual data is arranged sequentially.

To observe such a structure for yourself, take a look at any *dBASE*-compatible (.DBF) file. (You can read them with the DOS TYPE command.) You'll see some "garbage" at the start of the file, but included in the midst of these apparently meaningless characters you'll find the names of the fields used in the database file structure. (If you know what to look for and where to look for it, you could also determine field types and lengths.) Following the header you'll find the database data itself, arranged in a fixed-length format, each record containing the same number of characters.

Graphics file formats that follow a similar structure tend to encounter problems. They're fine as long as the amount of information kept for a given image remains constant. But if you edit the image—expanding the amount of information for a particular part of the image, for example—there's no room in the structure for the additional information. Thus the entire file from that point forward

must be rewritten. A second problem with this approach is that it often requires a long time to "scroll" sequentially through a large data file to find the part you want to change.

Then there is the problem of changing standards. If an image file format has been created for a black-and-white line image, how can it be updated so that files written in that format will be able to use a 16-color palette? Or a 256-color palette? Or gray-scale information or 24-bit color information? As scanning, display, and output technology advances, a way must be found to extend the file header to handle these new pieces of information.

THE FILE STRUCTURE

TIFF stands for Tagged Image File Format, and an image file structured according to the TIFF specification is fundamentally different from the header/sequential-field approach just discussed. Although .TIF files also begin with a brief (8 byte) header, from that point on, the similarity ends. Each piece of image information is arranged according to a set of rules rather than having an "assigned seat" in a set of sequential locations. The actual picture information could be scrambled almost randomly throughout the file.

What makes this flexibility possible is the use of *tags*, which are used to identify the function of different pieces of information in the file. The TIFF specification contains no less than 45 different tags, and while no file uses all 45, each file uses a combination of them.

One tag, for example, identifies how many bits of data per pixel are stored in

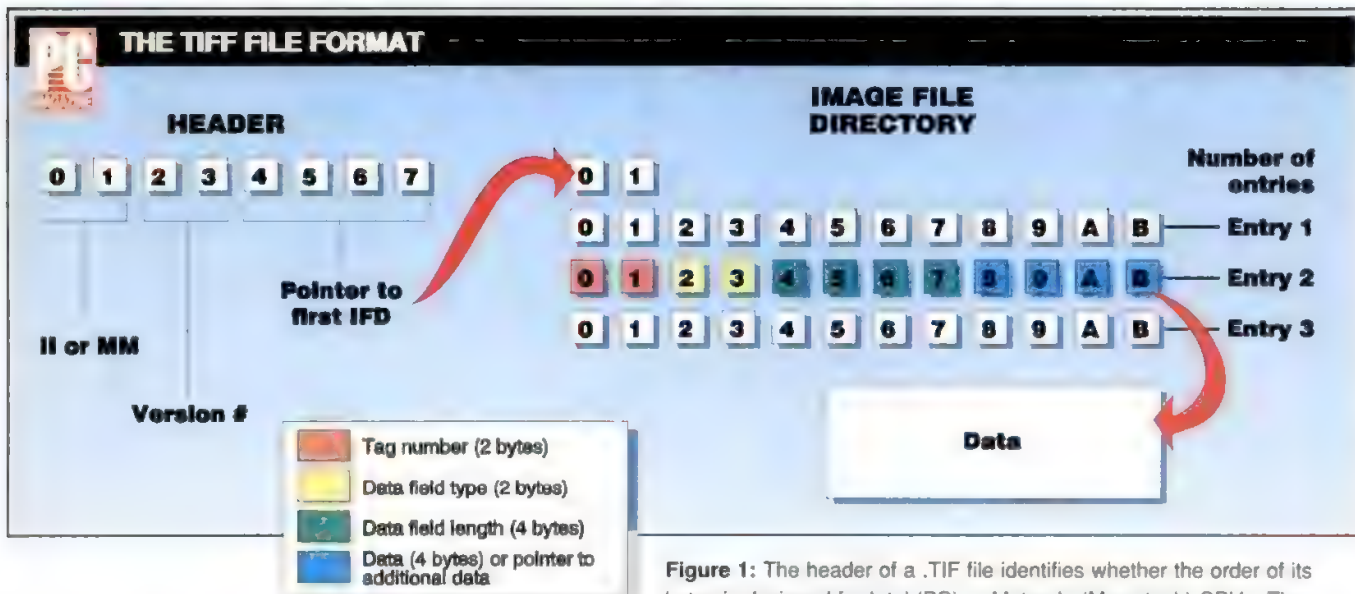


Figure 1: The header of a .TIF file identifies whether the order of its bytes is designed for Intel (PC) or Motorola (Macintosh) CPUs. The Image File Directory (IFD) contains the tag information.

the file. A black-and-white line drawing only uses 1 bit per pixel, while some gray-scale images may use 8 bits and a full-color image may require 24 bits per pixel. Another tag is used to identify which (if any) compression technique was applied to the image data. There are even tags that can be used to identify the artist who created the image.

THE HEADER

Every .TIF file begins with an 8-byte header, which is diagrammed in Figure 1. The first 2 bytes in the header are either 49h 49h or 4Dh 4Dh, which correspond to the ASCII characters "II" and "MM." The "I" stands for "Intel" and the "M" for "Motorola." .TIF files are designed to be written and read by both PC and Macintosh computers, which means taking into account the different internal architectures of these computers' CPUs. The "II" setting specifies that the least-significant byte is listed first for 16-bit and 32-bit integers, while the "MM" setting specifies putting the most-significant byte first. All programs designed to read .TIF files should support this feature, as it makes it easier to exchange images between Macs and PCs.

The next 2 bytes are called the "Version Number." This is something of a misnomer, since the value specified is always 2Ah (42 decimal)—even though we are now up to Version 5.0 of the TIFF specification and 6.0 is on the way.

The last 4 bytes of the header contain a pointer that marks the number of bytes from the start of the file to the first Image File Directory, or IFD. The specification

The reason for providing for the possibility of more than one IFD is so that a .TIF file can store more than one image in the same file.

could have called for placing the first IFD entry immediately after the version number in the file, but instead the designers again chose to provide some flexibility. The pointer allows you to locate the IFD anywhere in the file—even at its very end.

THE IFD(S)

The header, then, contains the minimum amount of information needed to identify a .TIF file, and it provides instructions on where to find the next chunk of informa-

tion, the Image File Directory.

The IFD is a table of tag information. Its first 2 bytes indicate the number of entries in the table. That many 12-byte entries follow, each entry carrying a tag label and information on the values assigned to that tag. If more information must be associated with the tag than will fit within 12 bytes, the last 4 bytes are used as a pointer to the location in the file where the additional information is stored. Again, this pointer can designate any convenient place in the file—even a section that is physically located before the IFD entries themselves. A hex dump of the first 323 bytes of PCLOGO.TIF is shown in Figure 2.

The last item in an IFD is a pointer. This one points to the *next* IFD; if there isn't one, it's simply filled with 0s. The reason for providing for the possibility of more than one IFD is so that a .TIF file can store more than one image in the same file. The separate IFDs are used to define the different images. Here again you can see how the use of tags and pointers adds flexibility. A straightforward sequential file design, though simpler, would have difficulty handling complex features like multiple images per file.

THE TIFF TAGS

I won't discuss all 45 of the TIFF tags shown in Figure 3; a quick survey will give you the flavor of their power and flexibility. In an IFD, the tags are listed in

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Lab Notes

numerical order, but it's easier here to look at the tags in functional groups. Remember, not all tags are required in every file.

Our first batch of tags concerns the organization of the image data. The `NewSubfileTag` indicates whether or not there is more than one image in the file. Depending on its value, the image to which it refers could be a reduced resolution view of another image in the file, a page in a multipage image (such as a fax or document-retrieval file), or a transparency mask for another image in the file. The `ImageWidth` and `ImageLength` tags describe the image in terms of pixels. The `XResolution` and `YResolution` tags are responsible for recording the number of pixels for each dimension per unit measure. The measurement unit itself is specified in the `ResolutionUnit` tag.

The `StripOffsets` tag contains a pointer to the actual bit image data, which can be located nearly anywhere in the file. The image data itself is organized sequentially, so a program needs only this one pointer to find all the image data. Rather than store each row of pixels in its own sequence, however, the TIFF specification calls for breaking up the horizontal segments of the image into "strips." It is possible (and many older programs did just this with small images) to store the entire image as a single strip. On the other hand, with full-color images, the size of such a strip quickly becomes unwieldy. Consequently, the TIFF specification recommends setting the size of the strips so that each one holds about 8K of data. The defined size is expressed by the number of strips specified, using the `StripByteCounts` and `RowsPerStrip` tags. The strip design contributes to image buffering efficiency. It also makes it possible to edit a portion of an image and then save the changes in a single block, eliminating the need to read and write many individual rows of pixels.

The characteristics correlated with the pixels are described by a variety of tags. The `SamplesPerPixel` and `BitsPerPixel` tags specify the number of planes and bits per plane in the image. For example, a black-and-white line art image would have 1 sample and 1 bit per pixel. A gray-scale or mapped-palette color image would also have a single plane, but might use 8



DECIPHERING A .TIF FILE

Byte Offset	Bytes in Hex
000000	49 49 2A 00 08 00 00 00 0F 00 FE 00 04 00 01 00
000010	00 00 00 00 00 00 00 01 04 00 01 00 00 00 E7 00
000020	00 00 01 01 04 00 01 00 00 00 E4 00 00 00 02 01
000030	03 00 01 00 00 00 01 00 00 00 03 01 03 00 01 00
000040	00 00 01 00 00 00 06 01 03 00 01 00 00 00 01 00
000050	00 00 11 01 04 00 01 00 00 00 C2 00 00 00 15 01
000060	03 00 01 00 00 00 01 00 00 00 16 01 04 00 01 00
000070	00 00 E4 00 00 00 17 01 04 00 01 00 00 00 D4 19
000080	00 00 1A 01 05 00 01 00 00 00 96 1A 00 00 1B 01
000090	05 00 01 00 00 00 9E 1A 00 00 1C 01 03 00 01 00
0000A0	00 00 01 00 00 00 28 01 03 00 01 00 00 00 02 00
0000B0	00 00 3D 01 03 00 01 00 00 00 01 00 00 00 00 00
0000C0	00 00 FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0000D0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0000E0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0000F0	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
000100	FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
000110	FF FF FF FF FF FF FF FF FF F0 00 00 00 00 00 00
000120	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000130	00 00 00 00 00 00 0F F0 00 00 00 00 00 00 00 00
000140	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
000150	00 00 0F

Figure 2: This hex dump (created using the LIST shareware program) shows the first 323 bytes of PCLOGO.TIF, a 6,822-byte file. Because this particular file creates a small black-and-white image, and the header, IFD, and image data are arranged sequentially, it is easy to decipher. Remember, though, that the TIFF specification does not require that this sequence be followed. The basic translation information (shown to the right) was obtained by using the TIFFREAD utility included with the TIFF Developer's ToolKit, though it has been reformatted. The "significance" notations and the parenthetical explanations in the listing are original.

bits per pixel. Finally, a 24-bit RGB color image would have three planes (red, green, and blue) plus 8 bits per plane.

Additional tags are used to describe

Map tag. The `GrayResponseCurve` and `GrayResponseUnit` tags indicate the optical density of the levels of gray in a gray-scale image.

Then there are the data compression tags. In addition to providing uncompressed image data, the TIFF 5.0 specification supports five different encoding schemes. The contents of the `Compression` tag indicate whether CCITT Group 3, fax-compatible Group 3, fax-compatible CCITT Group 4, LZW, or PackBits compression encoding is used.

CCITT Group 3 is a one-dimensional modified Huffman run-length-encoding compression method that was defined for black-and-white images only. In the Huffman encoding scheme, the most common values get the shortest codes, and no code is a prefix of any other code.

LZW compression is based on the Lempel-Ziv and Welch algorithm. As indicated by its use in many popular compression programs such as ARC, ZIP, and LHARC, the LZW system was designed to provide compression for all

The TIFF specification calls for breaking up the horizontal segments of the image into "strips."

how the information should be interpreted. The `PhotometricInterpretation` tag, for example, designates whether the minimum value in a black-and-white image is black or white, how RGB colors should be adjusted, and whether the image uses a color palette described by the `Color-`

Lab Notes

The following is a translation of the data shown to the left, based on the TIFF specification.

HEADER INFORMATION:

Offset Location	Item Name	ASCII/Decimal Value	Significance
0	ByteOrder	II	Intel processor byte order
2	Version	42	Always version 42
4	IldOffset	8	Offset for first IFD is 8 bytes

FIRST IFD:

8	Entries		15	15 tags in this IFD		
Offset Location*	Tag ID*	Tag Name	Data Type	Data	Value*	
10	254	[NewSubfileType] (only one image in file)	32-bit int.	0x00000000	0	
22	256	[ImageWidth] (231-pixel image width)	32-bit int.	0xe7000000	231	
34	257	[ImageLength] (228-pixel image length)	32-bit int.	0xe4000000	228	
46	258	[BitsPerSample] (1 bit per sample (black-and-white image))	16-bit int.	0x01000000	1	
58	259	[Compression] (no compression used)	16-bit int.	0x01000000	1	
70	262	[PhotometricInterp] (0=black; 1=white)	16-bit int.	0x01000000	1	
82	273	[StripOffsets] (first strip data starts at offset 194)	32-bit int.	0xc2000000	194	
94	277	[SamplesPerPixel] (one sample; RGB would be 3)	16-bit int.	0x01000000	1	
106	278	[RowsPerStrip] (228 rows per strip)	32-bit int.	0xe4000000	228	
118	279	[StripByteCounts] (6,612 bytes per strip)	32-bit int.	0xd4190000	6612	
130	282	[XResolution] (400/1=400; X resolution is 400 resolution units)	rational	0x961a0000	400 1	
142	283	[YResolution] (400/1=400; Y resolution is 400 resolution units)	rational	0x9e1a0000	400 1	
154	284	[PlanarConfiguration] (all sample values (there is only one) are contiguous)	16-bit int.	0x01000000	1	
166	296	[ResolutionUnit] (inches; (so image was created for 400-dpi resolution))	16-bit int.	0x02000000	2	
178	317	[Predictor] (used only for LZW compression, not here)	16-bit int.	0x01000000	1	
190	0	[IldOffset] (Offset for next IFD is 0 bytes (no more IFDs))			0	

* These values are in decimal, not hex.

IMAGE DATA:

A hex dump of the first 4 rows of data, starting at offset 194 (decimal, or 00C2 hex) follows:

```

row 0  ff ff ff ff ff ff ff ff ff ff
      ff ff ff ff ff ff ff ff ff ff
      ff ff ff ff ff ff ff ff ff ff
row 1  ff ff ff ff ff ff ff ff ff ff
      ff ff ff ff ff ff ff ff ff ff
      ff ff ff ff ff ff ff ff ff ff
row 2  ff ff ff ff ff ff ff ff ff ff
      ff ff ff ff ff ff ff ff ff ff
      ff ff ff ff ff ff ff ff ff ff
row 3  f0 0 0 0 0 0 0 0 0 0 0
      0 0 0 0 0 0 0 0 0 0 0
      0 0 0 0 0 0 0 0 0 0 f
row 4  f0 0 0 0 0 0 0 0 0 0 0
      0 0 0 0 0 0 0 0 0 0 0
      0 0 0 0 0 0 0 0 0 0 f

```

types of data, not just for graphics.

PackBits is a simple byte-oriented run length encoding scheme. 80 red pixels, for example, might be represented simply by "80" and "red". While relatively simple to implement, PackBits is rather slow and not particularly effective in its compression ratio. LZW, on the other hand, offers one of the fastest and most efficient compression options available with the TIFF specification.

Fax programs often use TIFF to store pages as they are sent or received. The Group3Options and Group4Options carry information about the image compression method used for the image in fax applications.

The standard also provides a handful of tags that simply serve as labels that can be associated with an image. Thus, the Artist, DateTime, and ImageDescription tags can be used to document information about the "who," "what," and "when" of the image. The Make, Model, and Software tags are used to cover the "how" of its creation.

The flexibility built into the TIFF specification has made it attractive to developers of applications other than simple computer graphics. TIFF is also being used in medical imaging programs. Moreover, some document-retrieval systems now rely on .TIF files, for TIFF provides document-handling tags, such as DocumentName, PageName, and PageNumber, designed to help track multiple images within a single .TIF file.

And if there aren't enough tags to satisfy every application developer, batches of up to five *private tags* can be assigned to developers on request. Since Aldus manages the TIFF specification, the Aldus Developers Desk is in charge of providing this service so that the same numbers aren't used by different developers. It isn't likely that they will run out of tags any time in the near future: the last specified tag is 320, which leaves over 65,000 tags potentially available.

PROBLEMS FOR PROGRAMS

As you'll appreciate by now, .TIF files can be enormously complex. You can have images with different resolutions, with different dimensions, and with different compression schemes. You can have different planes per pixel, different bits per pixel, and different color (or gray-scale) corrections factored into the image data. You can have the same image organized in a near-infinite number of dif-

Lab Notes

TIFF TAGS		
Tag (decimal)	Hex	Tag Name
254	FE	NewSubfileType
255	FF	SubfileType
256	100	ImageWidth
257	101	ImageLength
258	102	BitsPerSample
259	103	Compression
262	106	PhotometricInterpretation
263	107	Thresholding
264	108	CellWidth
265	109	CellLength
266	10A	FillOrder
269	10D	DocumentName
270	10E	ImageDescription
271	10F	Make
272	110	Model
273	111	StripOffsets
274	112	Orientation
277	115	SamplesPerPixel
278	116	RowsPerStrip
279	117	StripByteCounts
280	118	MinSampleValue
281	119	MaxSampleValue
282	11A	XResolution
283	11B	YResolution
284	11C	PlanarConfiguration
285	11D	PageName
286	11E	XPosition
287	11F	YPosition
288	120	FreeOffsets
289	121	FreeByteCounts
290	122	GrayResponseUnit
291	123	GrayResponseCurve
292	124	Group3Options
293	125	Group4Options
296	128	ResolutionUnit
297	129	PageNumber
301	12D	ColorResponseCurves
305	131	Software
306	132	DateTime
315	13B	Artist
316	13C	HostComputer
317	13D	Predictor
318	13E	WhitePoint
319	13F	PrimaryChromaticities
320	140	ColorMap

Figure 3: The key to the flexibility of the TIFF specification lies in the use of *tags* rather than fixed-format fields to organize the image data.

ferent sizes of strips, and the data can be organized in a near-infinite number of locations within a given .TIF file. Considering all the possible combinations and permutations, you might well wonder how any program ever manages to interpret a .TIF file correctly!

The complexity does pose some problems, both for applications that write the files and for those that read them. Writer programs must use the tags correctly, include

all the required tags, and make certain that the values supplied for all tags are correct. Despite all this, writer programs have it relatively easy: All they must do is get the information organized according to the specification and stored in a file. There are some tricky areas—such as coding the compression algorithms—but that's the worst problem writers have to contend with.

Reader applications have a somewhat tougher job. A writer program knows what it wants to achieve before it starts: It has an image that it wants to store. The reader program doesn't know what it has; it must rely on the writer program that wrote the file, and trust that the information that is supplied is correct. The biggest problem facing a reader program, however, is that it may not know how to correctly interpret all the tags in the writer's file.

This is obviously a problem when the writer is using a more recent version of the TIFF specification. Built into every reader program, therefore, must be the ability to step gracefully over any tags that it does not recognize. In other words, it must be able to survive an encounter with new tags. This is the aspect of the TIFF specification that makes it more or less backward-compatible with older versions of software.

COMING IN TIFF 6.0

The TIFF specification is not a static product, as the 5.0 version number indicates. Version 6.0, which incorporates a number of new ideas, has already been drafted.

In Version 6.0, there are new compression features that will improve the LZW compression algorithm. There are new features that support the CMYK (cyan, magenta, yellow, black) color model for color separations and color prepress operations. There are facilities for organizing the image data in tiles as opposed to strips, which can improve editing and compression performance for large, high-resolution color images. And there are features to support more-sophisticated multi-image .TIF files, through the use of a tree-structured nesting of IFDs, instead of the linear arrangement now in use.

Fortunately, if all these new features mean still further complexity, it is at least relatively easy to get all the details on the specification so you can experiment and learn more about it on your own. Aldus has a TIFF Developer's Toolkit that includes the Version 5.0 specification and the draft documents for Version 6.0. The

Toolkit also contains articles, tips, and useful examples provided both by Aldus and Hewlett-Packard. The kit comes with two Macintosh disks and two PC disks, and these contain the sample images that correspond to the examples detailed in the documentation. Also provided is a small utility, TIFFREAD, that reads the header and tag data, and tries to convert the first five scan lines to hexadecimal values. This is not an image display or print program, but it can be used to ex-

The tag structure and flexible file organization of the TIFF specification should help it keep pace as the flood of new graphics technology continues to sweep through the microcomputer field.

plore existing files or to test a TIFF writer's ability to create "legal" files. The utility comes with the source code, so you can see how it works.

The TIFF Developer's Toolkit is available directly from Aldus Corp. (list price \$50) and it can be ordered directly by contacting the Customer Relations Group at 206-628-2320.

Its extensibility, power, and versatility have made the TIFF specification one of the most widely supported in the PC graphics field. Its tag structure and flexible file organization should help it keep pace as the flood of new graphics technology continues to sweep through the microcomputer industry. If I were an application developer and had to pick one format to support in a given program for bitmapped images, TIFF would probably be my choice. ■

Alfred Poor is a contributing editor of PC Magazine.



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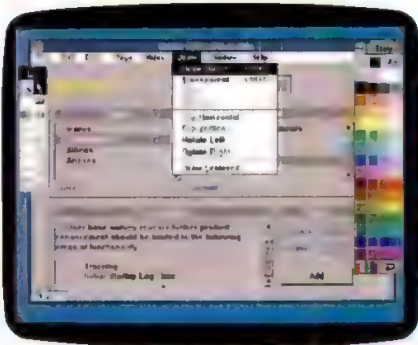
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by
Ethan Winer

Utilities

It's 5 P.M.: Do you know if your files are safe? You know you *should* back up the files you've worked on during the course of the day, but it's time to go home, and who could remember them all, anyway? If you could quickly copy just those files onto a floppy and toss the disk into your briefcase, you would; however, if you take the time to make even an incremental backup of your whole hard disk, you'll miss your train.

PCTODAY and PCCOPY provide the solution to this familiar problem. PCTODAY scans all the files on your hard disk and presents you with a list—redirectable to a file—of all the files bearing the current date. If you have more than one hard disk, PCTODAY will check each one—unless you tell it to restrict its attention to selected drives. And if you haven't been backing up daily, PCTODAY lets you list all the files modified since whatever date you specify.

PCCOPY can be used either in conjunction with PCTODAY or on a stand-alone basis. It takes the list prepared by PCTODAY and copies those files to your designated destination. PCCOPY warns you if all the files to be copied won't fit onto your target drive, so you can shift from a 360K to a 1.2MB floppy before proceeding. If you go ahead anyway, when the disk fills up, PCCOPY will also give you a chance to change disks and continue your backup.

Used alone, PCCOPY is similar to the DOS COPY command, except it copies only those files that are newer than any same-named files on the target drive or directory, plus any that do not exist on the target at all. In addition, PCCOPY gives you the ability to exclude specified files from the copying process.

The easiest way to obtain the source and executable versions of PCTODAY and PCCOPY is to download the PCTODAY.ZIP file from PC MagNet. Downloading instructions are given in the PC MagNet News page, which follows this article. If you do not have a

Back Up Your Day's Work Painlessly with PCTODAY and PCCOPY

■ PCTODAY and PCCOPY give you the options and operational ease that make routine file safety worth the effort.

modem, you can get a copy of the source code by mail or fax (fax length is approximately 12 pages) by sending a postcard with your name and address (or fax number, if applicable) to Katherine West, Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016. No phone calls, please! Note that to create the executable program files from their source code you will need both QuickBASIC 4.0 (or later) and Microsoft MASM 5.1 (or later).

USING PCTODAY

The full syntax for PCTODAY is

```
PCTODAY [d:] [/d mm-dd-yyyy]
[> filename.ext]
```

Entered without any command line arguments, PCTODAY displays the drive, directory, filename, and date of all files modified on the current date. Files with read-only, hidden, and system attributes are included. The listing pauses at the end of each screen page (if more than one is needed) and serves as a reminder of which files may need to be backed up.

By adding the optional /d switch, followed by any legal DOS date in standard

mm-dd-yyyy format, you can force PCTODAY to include earlier-dated files. To limit the drives in the search path or to include network and floppy disk drives, just specify them individually on the PCTODAY command line. (It's important that you remember to include the colon after each drive letter.) For example, to see a list of the files on drives C: and D: (only) with file dates on or after November 25, you would enter the line

```
PCTODAY C: D: /D 11-25-1991
```

Any number of drives can be similarly specified. Spacing is not crucial in any of the command line arguments, and drive letters and the date can be listed in any order or even intermixed.

To send the list to a file (for use by PCCOPY) instead of to the display, use the standard DOS redirection symbol (>) followed by any legal filename. You can put such a *filename.ext* on another drive, if desired. Thus, given the command

```
PCTODAY > D:LOGFILE.B25
```

PCTODAY will create LOGFILE.B25 as a filename (which is also known as a *response file*; see the syntax for PCCOPY) in the default directory of drive D:. LOGFILE.B25 contains the names of each file to be backed up in the same order as they would appear on-screen; however, it omits the file dates, the blank lines between directories, and the sign-on message. Restricting the listing to filenames only makes it easier for PCCOPY to process the list.

Utilities

In addition to using a PCTODAY list file as a source for PCCOPY, you can use it with PKWARE's popular PKZIP file compression utility. PKZIP lets you specify that the filenames to be processed are to be found in a response file rather than entered on the DOS command line. Thus, the three-line batch file

```
PCTODAY > PCTODAY.RSP
PKZIP PCTODAY.ZIP @PCTODAY.RSP
COPY PCTODAY.ZIP A:
```

will back up the day's work for your entire system into a compressed .ZIP file stored on drive A:. Note, however, that in this case you must be sure that after compression the .ZIP file will fit on a single floppy disk. If the .ZIP file is too large to fit on a single floppy, you may want to use SLICE, a *PC Magazine* utility that lets you store one file on multiple floppy disks.

USING PCCOPY

The full syntax of the PCCOPY utility is

```
PCCOPY Source [Destination]
[/x filespec]
```

or

```
PCCOPY @Responsefile [Destination]
```

Used as a standalone utility, PCCOPY works in much the same way as the DOS COPY command, except that it restricts its processing specifically to those files that *need* to be copied. If the destination drive or directory has an identical or newer file of the same name, PCCOPY will not overwrite it. That can save you a substantial amount of time when many large files are involved. To copy all unduplicated files from your current directory to the \WORK directory on network drive H:, you would enter:

```
PCCOPY *.* H:\WORK
```

As with COPY, you can omit the destination argument if you wish to copy to your current drive and directory. And if a source or destination drive is given but a path is not, the current directory for that drive will be used.

The final—and potentially most

powerful—feature of PCCOPY when used as a standalone utility is its ability to exclude one or more groups of files. Files to be excluded are identified with the /x command line argument, followed by an identifying *filespec*, as shown in the following line:

```
PCCOPY *.* H:\MYDIR /X *.BAK
```

In this example, the DOS wildcard * is used as part of the exclude specification to prevent the copying of any files that have a .BAK extension.

The ? and * wildcards can be applied to any common parts of a group of filenames, of course—not simply to an extension—and PCCOPY supports the use of up to ten different exclude specifications. The placement of the /x specifications is not important; they can even be intermixed with the source and response file (@responsefile) parameters. Note, however, that the /x switch is recognized only when PCCOPY is working with a source filespec. As explained below, filenames contained in a response file are copied

unconditionally; any /x commands are simply ignored.

To use PCCOPY with PCTODAY, you begin by having the latter create a response file (arbitrarily named LOGFILE.B25 previously). Then, instead of supplying PCCOPY with a filespec, you tell it to copy the files listed in this response file by preceding it with an at sign (@), as follows:

```
PCCOPY @LOGFILE.B25 A:
```

Although you will presumably use PCTODAY to create the response file most of the time, any group of files can be put into a response file. Remember, however, that when a response file is used with PCCOPY, the copying is unconditional: All the files in a response file will be copied, whether or not they are newer than the same-named files on the target drive and directory.

If at any time you forget the syntax for either PCTODAY or PCCOPY, entering the command with the /? switch will display the syntax.

DISPLAY SUBROUTINE

```
SUB Display
  CurrentDir$ = GetDir$
  REDIM FArray(1 TO 1) AS Names
  NumFiles = LoadNames$(FArray(), LocalZero)
  TotalFiles = TotalFiles + NumFiles
  ThisDrive$ = CHR$(GetDrive$ + 65)

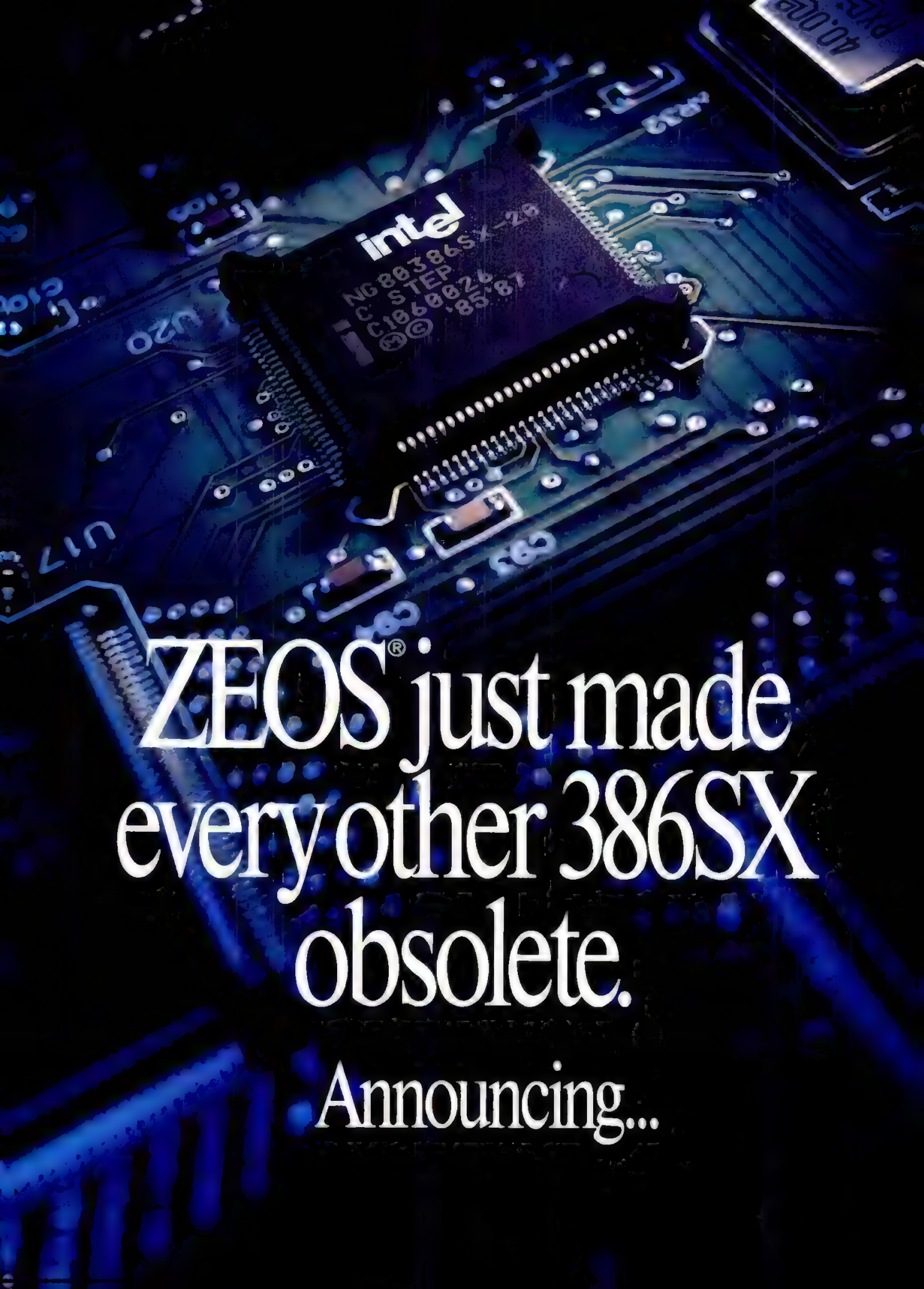
  FOR X = 1 TO NumFiles
    PRINT ThisDrive$; " "; CurrentDir$;
    IF CurrentDir$ <> "\" THEN PRINT "\";
    PRINT FArray(X).FileName;
    IF NOT Redir THEN
      PRINT " ";
      PRINT Trim$(FArray(X).FileMonth); "-";
      PRINT Trim$(FArray(X).FileDay); "-";
      PRINT Trim$(FArray(X).FileYear)
    ELSE
      PRINT
    END IF
  NEXT
  IF NumFiles AND NOT Redir THEN PRINT

  REDIM DArray(1 TO 1) AS Names
  DirCount = LoadNames$(DArray(), -1)

  IF DirCount THEN
    IF CurrentDir$ = "\" THEN
      Prefix$ = ""
    ELSE
      Prefix$ = CurrentDir$
    END IF

    FOR X = 1 TO DirCount
      CHDIR Prefix$ + "\" + DArray(X).FileName
      CALL Display
    NEXT
  END IF
END SUB
```

Figure 1: Display is the core subroutine PCTODAY uses to navigate directories on a hard disk. After processing all of the files in the current directory, it then calls itself repeatedly for each additional subdirectory level below.

A close-up, high-angle photograph of an Intel 386SX-25 microprocessor mounted on a green printed circuit board (PCB). The processor is a square chip with a black top surface. The Intel logo is visible in white on the top left of the chip. Below the logo, the text "NG80386SX-25" is printed, followed by "STEP", "ZCC1060026", and "© 1985". The chip is connected to the PCB via numerous gold pins. The PCB itself is green with various components, including capacitors and other integrated circuits, visible in the background. The lighting is dramatic, with strong highlights and deep shadows, emphasizing the texture of the chip and the circuitry.

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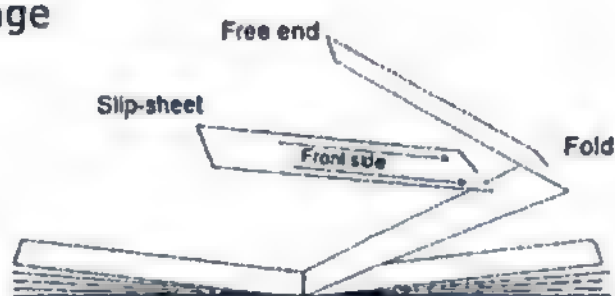
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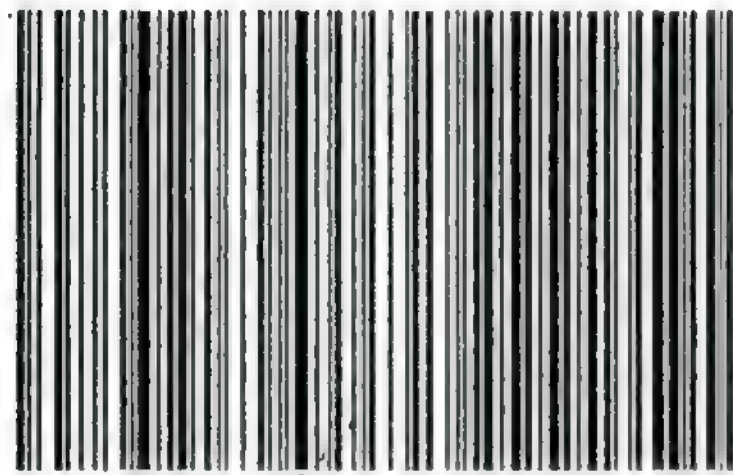
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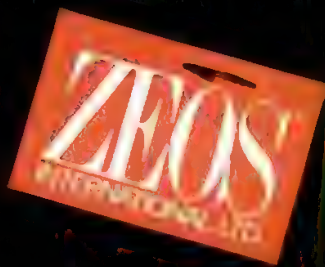
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QUERYING THE SYSTEM WITH IOCTL

by Ethan Winer

Few programmers fully understand three of the DOS services used by PCCOPY. One of these services, which reports whether a specified handle is a file or a device, allows PCTODAY to determine whether its output has been redirected. The other two services report whether a given drive letter refers to a remote (network) drive and whether

its medium is removable, as in the case of a floppy disk drive.

Someone running a BASIC program can redirect its output to a disk file by using the greater-than symbol (>). Unfortunately, there is no direct way for a program written in a high-level language (like BASIC) to know whether the user has done this. Fortunately, however, the DOS IOCTL (Input/

Output Control) services (44h) provide detailed information about all attached devices, which include the keyboard, display, and disk drives. Although there are many useful subfunctions of DOS service 44h, in this column we will be concerned only with subfunctions 0, 8, and 9.

PCTODAY's Redirected function uses subfunction 0 to determine whether the program's output has been redirected. It does this by checking whether a given system handle refers to a device or to a file. Service 44h subfunction 0 is invoked by placing a value of 4400h into AX, the standard output handle 1 into BX, and then calling interrupt 21h. If bit 7 is set upon return, then the handle refers to a device, so you know that output has not been redirected. This bit is tested with an AND instruction. Note that you could alternatively determine whether a program's input was redirected simply by changing the handle value from 1 to 0 (Standard Input).

Service 44h subfunction 8 reports whether a given drive contains removable media (a floppy disk), and subfunction 9 indicates that a drive is remote (on a network). PCTODAY's Removable and Remote functions use these subfunctions to determine whether or not the drives should be considered when searching for files. The code for these three PCTODAY functions is shown in Figure A.

USING DOS IOCTL SERVICES

```

FUNCTION Redirected% STATIC
  Registers.AX = 4H40H      'service 44h tells if a handle is redirected
  Registers.BX = 1         'handle 1 is the console output (STDOUT)
  CALL Interrupt(DOS, Registers) 'DOS does the dirty work

  Redirected% = -1         'assume we are being redirected
  IF Registers.OX AND 80H THEN 'well, are we?
    Redirected% = 0       'no
  END IF
END FUNCTION

FUNCTION Remote% (Drive) STATIC
  Registers.AX = 4H40H      'checks if redirected network drive
  Registers.BX = Drive + 1 'service 44 in AX, function 9 in AL
  CALL Interrupt(DOS, Registers) '8 = default, 1 = A, 2 = B, and so forth
  IF Registers.OX AND 40H THEN 'call DOS
    Remote% = -1           'BX contains the info in bit 12
                           'if that bit is set it's remote
  ELSE
    Remote% = 0           'otherwise it's not
  END IF
END FUNCTION

FUNCTION Removable% (Drive) STATIC
  Registers.AX = 4H40H      'tests if a drive is removable
  Registers.BX = Drive + 1 'changeable block service
  CALL Interrupt(DOS, Registers) 'adjust to 1-based
  Removable% = Registers.AX - 1 'DOS does the hard part
                              'return -1 if removable, 0 if not
END FUNCTION

```

Figure A: The three PCTODAY functions shown here make use of DOS IOCTL services (44h subfunctions 0, 8, and 9), which are not well understood by many programmers.

PROGRAMMERS' NOTES

PCTODAY and PCCOPY were written for use with Microsoft QuickBASIC, Version 4.0 or later. Several programming tricks worth mentioning were employed in these programs. Unfortunately, only excerpts from the source code can be shown here as figures, but the full version can be downloaded from PC MagNet.

The main function in PCTODAY is Display, shown in Figure 1, which examines all the files in each directory of the current drive. Before calling Display, the program saves the current drive and directory, and changes to the root. Display

then begins by obtaining the current directory and calling LoadNames to load a TYPE array with information about the files in that directory. The date of each file is stored in the array along with the filename. Both the filename and date are displayed when the final list is printed to the screen.

LoadNames is designed as a function, and it returns the total number of filenames found and loaded into the array. This total is accumulated as PCTODAY runs, so it, too, can be reported when the program finishes. Once the filenames and other information have been loaded, Display

invokes the GetDrive function to determine the current default drive. The drive and directory are used later when PCTODAY prints the full name of each file whose date is recent enough to be listed.

All the filenames are processed in a FOR/NEXT loop. If the output is not being redirected, both the complete name and the date are listed. If the output is being redirected to a response file, the date is not included. The sidebar, "Querying the System with IOCTL" shows you how PCTODAY can determine whether or not the program output is being redirected.

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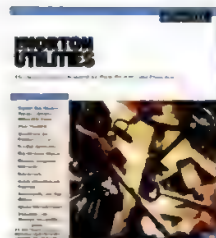
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CIRCLE 344 ON READER SERVICE CARD

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FILECOUNT FUNCTION

```

FUNCTION FileCount% (DirFlag) STATIC
    Registers.DX = VARPTR(DTAData)      'set new DTA address
    Registers.DS = -1                   'the DTA is in DGROUP
    Registers.AX = &H1A80               'specify service 1Ah, set DTA service
    CALL Interrupt(DOS, Registers)      'call DOS to do the real work

    Registers.DX = SADD(Spec$)          'the file specification address
    Registers.DS = -1                   'near strings are in DGROUP
    Registers.CX = 39                   'find files, also hidden/read-only
    IF DirFlag THEN Registers.CX = 19   'find directories instead
    Registers.AX = &H4E80               'find first matching name

    Count = 0                           'clear the counter
    DO
        CALL Interrupt(DOS, Registers) 'see if there's a match
        IF Registers.Flags AND 1 THEN EXIT DO 'no more files
        IF DirFlag OR TestDates% THEN 'test file dates only
            IF DirFlag THEN 'do they want directories?
                IF ASC(DTAData.Attribute) AND 16 THEN 'is it really a directory?
                    IF ASC(DTAData.FileName) <> 46 THEN 'filter out "." and ".."
                        Count = Count + 1 'increment the counter
                    END IF
                END IF
            ELSE 'they want regular files
                Count = Count + 1
            END IF
        END IF
        Registers.AX = &H4F00 'find the next name
    LOOP

    FileCount% = Count 'assign the function
END FUNCTION

```

Figure 2: PCTODAY uses the FileCount function to count files and directories. The TestDates function (not shown) is then used to determine whether the current file should be considered in the total count.

Once all of the files that qualify for inclusion have been printed, Display loads another array with the names of all the directories that fall under the current directory. Since PCTODAY reports all of the files in all of a disk's directories, it must be able to navigate through all directory levels. Display changes to each subdirectory in turn and calls itself to display the qualifying files it contains. If other directories below an existing subdirectory are encountered, Display calls itself yet again to process those directories before it returns to the level above.

Because Display calls itself repeatedly, it must be designed as a nonstatic (recursive) procedure. This type of routine is at the core of all directory tree searching utilities. The key factor in any recursive procedure is that each new invocation establishes an entirely new set of working variables. If this were not done, each time REDIM was used to create a new array of directory names (DArray), the state of the level above would be destroyed. It is important to understand that when Display has called itself, say, three times, there are actually three different

sets of active arrays—all having the same name—in memory.

The LoadNames function calls upon FileCount, shown in Figure 2, to count

The judicious use of shared variables is just one technique that PCTODAY uses to keep program size to a minimum.

the number of matching files. These two routines are very similar in operation, their only real difference being that LoadNames also assigns each file's name and date to a TYPE array element after it has been qualified as being recent enough to include in the report.

FileCount calls upon the DOS FindFirst and FindNext services to process each file whose name matches a given specification. Before these services can be called, however, DOS must establish a special area of memory, called a disk transfer area (DTA). When you ask DOS to find the first file that matches, say, *.BAS, DOS places the complete filename into the DTA. Other information is assigned there as well, including the file's date, time, size, and attributes.

The same DOS services are used to locate both directory and filenames. This adds slightly to the complexity of the FileCount function. For one thing, the dot (.) and double-dot (..) directory entries must be filtered out, since they merely refer to the current and parent directories, respectively. Further, all directories must be considered, regardless of the date of their creation. FileCount must thus consider all matches when processing directory names, but discriminate based on dates when counting files.

Files are counted in a DO loop until DOS sets the carry flag to indicate that no more are available. For each file that passes the date test, the variable Count is incremented. The AX register is initially assigned to 4Eh (find first matching file), and then to 4Fh (find next file) at the end of the loop.

PCTODAY employs a number of techniques to keep program size to a minimum. One is the judicious use of shared variables. For each new variable used in a static procedure, additional memory is needed to store it. Therefore, a single Registers TYPE variable is dimensioned once in the main portion of the program, and that variable is subsequently shared by all the procedures that use it. Since this TYPE variable requires 20 bytes and is used by 8 different routines, 140 bytes are saved. Several other variables are shared for the same reason.

Another trick that improves efficiency is the use of the variable Zero\$. This variable is assigned once, at the start, to CHR\$(0); it is subsequently used three times in the program. Although many programmers do not know it, CHR\$ is actually a called subroutine that is contained in the BASIC runtime library. Each time CHR\$ is used, BASIC generates additional code to set up and call this routine. Similarly, COMMAND\$ is assigned just once to the Cmd\$ variable, and Cmd\$ is then used repeatedly throughout the program.


```

FILEINFO

DoUpdate = 0
CALL FileInfo(File(1, 1), SourceDTA)
CALL FileInfo(File(1, 2), TargetDTA)

FOR X = 1 TO 6
  IF File(X, 1) > File(X, 2) THEN
    DoUpdate = -1
    EXIT FOR
  ELSEIF File(X, 1) < File(X, 2) THEN
    EXIT FOR
  END IF
NEXT

IF DoUpdate THEN ....

...
...

SUB FileInfo (Info AS FInfo, DTA AS DTAType) STATIC
  Info.Year = PDQShr$(DTA.FileDate AND &HFE00, 9) + 88
  Info.Month = PDQShr$(DTA.FileDate AND &H1E0, 5)
  Info.Day = DTA.FileDate AND &H1F
  Info.Hour = PDQShr$(DTA.FileTime AND &HF800, 11)
  Info.Minute = PDQShr$(DTA.FileTime AND &H7E0, 5)
  Info.Second = PDQShr$(DTA.FileTime AND &H1F, 1)
END SUB

```

Figure 3: FileInfo is called with half of a two-dimensional array as the first argument, but inside the subprogram, the same array is assigned as a TYPE variable.

INSIDE PCCOPY

PCCOPY employs many of the same methods as PCTODAY. It, too, reads filenames into an array and performs date (and time) comparisons. PCCOPY is necessarily more complicated than PCTODAY: It has more to do. For example, the ability to exclude one or more groups of files via the /x switch requires PCCOPY to do more work when parsing its command line. PCCOPY also has to copy files and set the new file's date and time to match that of the source file. Note that although PCCOPY uses some of the same procedure names as PCTODAY, the routines are not identical.

PCCOPY begins by examining the command line arguments, isolating the source and destination parameters. It also extracts each use of the /x exclude option, filling a string array with each separate specification. Once the number of /x commands is known, all of the filenames that match any of the exclude specifications are loaded into a second string array. This list of names is examined repeatedly later, as each candidate filename is about to be copied. If a file's name is found in the array, it is skipped.

Two separate blocks of code do the actual work in PCCOPY. One of these is used if a response file was specified. In this case, the files are simply copied with-

out regard to their date, time, or to the presence of a same-named file on the target drive and directory. The second code block determines whether a file with the same name exists in the target location, and, if one does, whether the target

One of the most useful features of TYPE structures is that you can group related information into a single variable.

file is older and thus needs updating.

Because the date and time information is needed for both the source and destination files, two DTA blocks must be maintained. One is made active when the source file is being read, the other when processing the destination. The actual date and time comparisons are handled in a FOR/NEXT loop that compares the years, months, days, hours, minutes, and sec-

onds, in that order. As soon as PCCOPY can determine that a source file is either newer or older, it stops checking. If the source file is newer, it is copied.

The FileInfo listing shown in Figure 3 implements a neat way of passing one portion of a two-dimensional integer array to a BASIC subprogram that expects to receive a TYPE variable. One of the most useful features of TYPE structures is that you can group related information into a single variable and refer to each component by name. In FileInfo, this clarifies the date and time assignments where the various TYPE members are calculated. What PCCOPY is actually passing, however, is a numeric array, whose components can be compared by element number in a FOR/NEXT loop. Using a TYPE variable here would have required 12 different comparisons. The downside of implementing this trick is that it precludes running PCCOPY within the QuickBASIC editing environment. C and Pascal have let you do this since their inception, but QuickBASIC hasn't caught up.

When designing PCCOPY, I faced an interesting problem: trying to prevent a file from being copied on top of itself. Normally, when a program needs to create a file, it uses BASIC's OPEN FOR OUTPUT command. This either creates the file (if it does not exist), or truncates the file length to 0 (if it already exists). If the file does exist and was not so truncated, and if the new copy was shorter than the old one, unwanted remnants of the original version would remain at the end. But what happens if the source and destination file are the same? In that case, truncating erases the source file too—even before it is copied!

Fortunately, PCCOPY will not even try to copy a source file unless it is *newer* than the destination file, and when the same file is being considered, the dates are the same. But when PCCOPY is run using a response file, the copying is unconditional and the file dates are ignored. The solution I devised for this contingency was to open both files for binary access and delete the destination file only if it is in fact larger than the source. In the unlikely event that a file really is copied onto itself, the data is harmlessly read from and written to the same places in the file.

COMPILING PCTODAY AND PCCOPY

The versions of PCTODAY and PCCOPY available on PC MagNet were compiled

BIT SHIFTING IN BASIC

by Ethan Winer

One important feature that regrettably has never been included in BASIC is the ability to shift bits in an integer variable. Both PCTODAY and PCCOPY need this ability when they read each file's date and time values.

In an attempt to minimize disk space, DOS packs these values into only 2 bytes each. That is, the file's year number is stored in the highest 7 bits of the time word, the month is kept in the

4 bits directly below that, and the day is stored in the lowest 5 bits. The file's time is packed similarly in a separate integer word.

The problem is to isolate these bits and convert them into the appropriate date and time values. Although bits can be shifted by simply multiplying and dividing by a power of 2, the highest bit is problematic. BASIC considers all integer values to be signed, which means that the highest bit is used

to indicate whether the number is positive or negative. Therefore, dividing an integer whose highest bit is set results in an incorrect negative value. Although it is possible to copy the high byte into the low byte using the PEEK function and the POKE statement, that method is undeniably clumsy.

To solve the problem more elegantly, I wrote the PDQShl and PDQShr functions shown in Figure A. I used assembly language so the bits can be shifted directly. As you can see, these are extremely simple functions that use only five commands each. Indeed, PDQShl and PDQShr are identical but for a single instruction. You can see them in use in Figure 3.

To keep the functions as small as possible, the stack is accessed directly, using the BX register. Normally, an assembly language routine uses BP to read values from the stack. But BASIC (and most high-level languages) require that BP not be changed. Most routines begin by saving BP and then copying SP (the stack pointer) into BP. When the routine finishes, BP must be restored. To avoid those extra steps, the functions presented here simply use BX, which does not need to be preserved.

PDQSHL AND PDQSHR FUNCTIONS

```
.Model Medium, Basic
.Code

PDQShl Proc
    Mov BX,SP                ;address the stack manually for speed/code size
    Mov AX,[BX+06]           ;get the value
    Mov CX,[BX+04]           ;and the number of places
    Shl AX,CL                 ;shift the bits
    Retf 4                    ;return to BASIC popping two parameters
PDQShl Endp

PDQShr Proc
    Mov BX,SP                ;address the stack manually for speed/code size
    Mov AX,[BX+06]           ;get the value
    Mov CX,[BX+04]           ;and the number of places
    Shr AX,CL                 ;shift the bits
    Retf 4                    ;return to BASIC popping two parameters
PDQShr Endp
End
```

Figure A: Written in assembly language, the PDQShl and PDQShr functions allow bit shifting to decipher the date and time bytes in the disk transfer area.

using BASIC PDS 7.1, and linked with Crescent Software's P.D.Q. replacement library. By using P.D.Q. I was able to achieve .EXE file sizes that were smaller than if I used the PDS libraries—important to consider when preparing files for PC MagNet. However, as posted, the source code for the two programs is ready to be compiled and linked using the normal QuickBASIC and PDS libraries.

Microsoft's version of CALL interrupt uses two Registers TYPE variables. One holds the register contents on entry, and the other receives them when interrupt has finished. In order to reduce the size of the interrupt routine, P.D.Q. uses a single TYPE variable instead. Since there is no real need to maintain two copies of the CPU registers, requiring an extra variable is wasteful. To build these

programs to use regular BASIC, however, I had to specify Registers twice at each interrupt call, thus:

```
CALL Interrupt(DOS, Registers,
Registers)
```

BASIC does not provide any way to shift bits in an integer variable. Unfortunately, as discussed in the sidebar "Bit Shifting in BASIC," such a facility is needed when evaluating the date and time values in the DTA structure. To remedy this, I wrote the two assembly language PDQShl and PDQShr functions. Note that these must be linked with the BASIC object files.

If you use the BASIC PDS compiler, do not use the /fs (far strings) option. Far strings are not necessary for small utili-

ties such as these, and using that feature adds unnecessarily to the code size. Further, using far strings will complicate the interrupt calls: the string segment will also have to be determined and passed to DOS. Note, however, that since the QBX environment uses far strings only, neither of these programs can be run interactively inside QBX.

PCTODAY and PCCOPY are a quick and convenient way to make backing up part of your everyday routine. Now there's no excuse not to back up anymore.

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CIRCLE 282 ON READER SERVICE CARD

by
Charles Petzold

Environments

The waveform audio facilities of the Multimedia Extensions to *Windows* 3.0 turn your PC into something like a digital tape recorder. You record sound through a microphone (or other audio source) where it is converted to a binary form; later you can play it back. Because the sound is stored in your computer, you can easily manipulate it through software.

The application program interface (API) for waveform audio consists of 31 function calls—12 with the prefix *waveIn* for sampling sound input and 19 with the prefix *waveOut* for playing sound—along with 5 data structures and 6 messages. In the last issue, I showed how to use some of the *waveOut* functions to generate sine waves.

Before demonstrating other sample programs in future columns, I'd like to present an overview of the waveform audio API, in approximately the order you'd use the functions in a program.

QUERYING THE HARDWARE

The waveform audio API is device-independent. However, not all devices are created equal. An important part of any device-independent API is the ability to query the capabilities of the installed hardware.

It's possible that multiple hardware devices for waveform audio may be present in the same machine. For this reason, the API includes functions to obtain the number of devices (regardless of whether the devices are in use by another program). For waveform audio input, the function is:

```
wNumDevs = waveInGetNumDevs ();
```

A similar function is available for waveform output:

```
wNumDevs = waveOutGetNumDevs ();
```

These two functions could return different values. The return values should be at least 1. If the functions return 0, that's a

The Waveform Audio Application Program Interface: An Overview

■ The Multimedia Extensions to *Windows* 3.0 let you store, manipulate, and play back sound. Here's a look at the functions, data structures, and messages that make this possible.

problem; it means the user has the Multimedia Extensions installed, but not the required hardware! All other *waveIn* and *waveOut* functions return 0 if the function is successful and a nonzero error code otherwise. I'll discuss error handling toward the end of this article.

You can obtain information about the capabilities of the waveform audio input devices using the function:

```
waveInGetDevCaps (id, &waveincaps,  
sizeof (WAVEINCAPS));
```

The ID value passed as the first parameter identifies the device; it can range from 0 to one less than the number of devices. Again, there's a similar function for waveform output:

```
waveOutGetDevCaps (id,  
&waveoutcaps, sizeof  
(WAVEOUTCAPS));
```

In both cases the second parameter points to a structure and the last parameter indicates the size of this structure. The func-

tions fill in the structure fields. The *WAVEINCAPS* and *WAVEOUTCAPS* structures are very similar, as shown in Figure 1.

The *wMid* and *wPid* fields in these structures contain ID codes that identify the manufacturer of the device driver and the waveform hardware. Each manufacturer and product will be assigned its own ID number. This is handy if you know that some hardware has special features and you want to take advantage of them. The third field is a 2-byte driver version number, and the fourth field contains a 0-terminated ASCII product name (for example, "Soundblaster Waveform Input"). If multiple devices are installed in a machine, you can present the names of the devices in a list box and let the user choose one.

The *dwFormats* field is a series of bit flags identifying the standard audio formats the device can handle. There are 12 identifiers currently defined in the *MMSYSTEM.H* header file to extract this information. The 12 identifiers are for all combinations of the three standard sampling rates (11.025 kHz, 22.05 kHz, and 44.1 kHz), the two standard sample sizes (8 bit and 16 bit) and the number of channels (monaural or stereo). The *wChannels* field also indicates the number of channels (1 for monaural or 2 for stereo).

The *WAVEOUTCAPS* structure has an additional field called *dwSupport*. This field is a series of bit flags indicating whether the waveform audio output device is capable of changing the volume, pitch, or playback rate of the sound. I'll discuss these features in a bit.

Environments

It isn't necessary to query device capability before using the waveform audio hardware. If you're using the minimum standard sampling rates (11.025 kHz for input, and 11.025 kHz or 22.05 kHz for output) with an 8-bit sample size, you can simply open the device with those parameters. Or you can attempt to open the device with other parameters and check if the function is successful.

OPENING THE DEVICE

To use the waveform audio hardware, you open a device, which is much like opening a file. There are separate functions for waveform input and output:

```
wErr = waveInOpen (&hWaveIn, id,  
    &waveformat, dwCallback,  
    dwCallbackData, dwFlags) ;
```

```
wErr = waveOutOpen (&hWaveOut, id,  
    &waveformat, dwCallback,  
    dwCallbackData, dwFlags) ;
```

The second parameter is the same ID number used in the device capability functions. It can range from 0 to one less than the number of devices. To use the first device, specify 0.

Waveform devices cannot be shared. If another program has a waveform device already opened, attempting to open the device again will cause the open function to return a nonzero error code. If the open

function is successful, a handle to the device is stored in the variable pointed to by the first parameter. This handle becomes the first parameter to all the other waveform audio function calls.

The third parameter is documented as a pointer to a WAVEFORMAT structure (shown in Figure 2), but it's not quite that simple. This parameter is actually a pointer to a PCMWAVEFORMAT structure (also shown in Figure 2), the first field of which is a WAVEFORMAT structure. PCM stands for *pulse code modulation*, the type of sampling used in *Multimedia Windows*.

Why are there two structures? And why aren't the open functions simply documented as using a pointer to a PCMWAVEFORMAT structure? Well, although PCM is the only type of sampling supported by *Multimedia Windows* now, future versions may support other types of sampling formats. In these cases, another structure similar to PCMWAVEFORMAT would be defined. This new structure would also contain WAVEFORMAT as the first field, but would include other fields as well that are specific to the other format.

For now, you set the wFormat field to WAVE_FORMAT_PCM, the nChannels field to 1 or 2 for monaural or stereo, the nSamplesPerSec field to the sampling rate (generally 11,025, 22,050, or 44,100), nAvgBytesPerSec to the sampling rate times the sample size in bytes (generally 1 or 2) times the number of channels, and nBlockAlign to the bytes per samples (the sample size in bytes times the number of channels). Set the wBitsPerSample field

of the PCMWAVEFORMAT structure to the sample size in bits times the number of channels.

You can set the fields of these structures to indicate nonstandard sampling rates and sample sizes. It's possible the hardware can handle those. If not, the open function will return an error code.

As we saw in the last column, the waveform audio API uses messages to convey information back to the program. (I'll describe these messages shortly.) You can process the messages in a window procedure or a callback function. If you use a callback function, it must be exported from a dynamic link library. The DLL callback function is called in response to a hardware interrupt from the device, and it is severely limited in the *Windows* functions it can call—PostMessage and timeGetSystemTime only.

The fourth parameter to the two open functions is either a window handle or the address of the DLL callback function. If you use a callback function, the fifth parameter can be some data (or a pointer to some data) that is passed to the callback function with each message.

The last parameter can be CALLBACK_WINDOW (to indicate you're using a window procedure for the messages), CALLBACK_FUNCTION (to indicate a DLL callback function), or WAVEFORMAT_QUERY (to determine if a waveform format is supported without actually opening the device). In this last case, you can set the first, fourth, and fifth parameters to NULL.

When calling the waveOutOpen function, you don't need to process messages if you simply want to send waveform data out to the hardware. In this case, you can set the dwCallback parameter to NULL and the dwFlags parameter to 0. However, your program will not be informed when the sound has finished playing. You'd probably want to set a one-shot timer based on the length of the sound to clean up (deallocate memory and close the device).

CALLBACKS AND MESSAGES

If you use a window procedure for receiving messages, you should be prepared to process three different messages: MM_WIM_OPEN, MM_WIM_DATA, and MM_WIM_CLOSE for input, and MM_WOM_OPEN, MM_WOM_DONE, and MM_WOM_CLOSE for output. These messages are all posted to the program's message queue rather than sent directly to the window procedure.

THE WAVEINCAPS AND WAVEOUTCAPS STRUCTURES

```
typedef struct wavincaps_tag  
{  
    WORD    wMid ;                // manufacturer id  
    WORD    wPid ;                // product id  
    VERSION vDriverVersion ;      // version no.  
    char    szPname [MAXPNAMELEN] ; // manufacturer  
    DWORD   dwFormats ;           // formats  
    WORD    wChannels ;           // channels  
}  
WAVEINCAPS ;  
  
typedef struct wavoutcaps_tag  
{  
    WORD    wMid ;                // manufacturer id  
    WORD    wPid ;                // product id  
    VERSION vDriverVersion ;      // version no.  
    char    szPname [MAXPNAMELEN] ; // manufacturer  
    DWORD   dwFormats ;           // formats  
    WORD    wChannels ;           // channels  
    DWORD   dwSupport ;           // output support  
}  
WAVEOUTCAPS ;
```

Figure 1: These structures are used to obtain the capabilities of a waveform audio device.

Environments

You receive one of the two OPEN messages after you call the open function described above. You receive the CLOSE message when you close the device (described later). For input, you receive the MM_WIM_DATA message when a buffer you supply for receiving the waveform data is full. For output, you receive the MM_WOM_DONE message when the buffer you supply with the waveform data is finished playing.

In all cases, the wParam message parameter is the handle to the waveform device. For the MM_WIM_DATA and MM_WOM_DONE messages, the lParam message parameter is a pointer to a WAVEHDR structure.

In the case of a DLL callback function, the messages have similar names: WIM_OPEN, WIM_DATA, and WIM_CLOSE; WOM_OPEN, WOM_DONE, and WOM_CLOSE. The callback function is called immediately, sometimes in response to a hardware interrupt.

HEADERS AND BUFFERS

For waveform audio input, you supply a buffer to the API for receiving the waveform data. For output, you supply a buffer to the API that contains the waveform data you want played. (I'll describe how to do this shortly.) In both cases, you must allocate space for these buffers by calling GlobalAlloc with the GMEM_MOVEABLE and GMEM_SHARE flags.

In the case of waveform input, you generally don't know the total duration of the sound that will be sampled. A program that samples sound will usually let the user click on something to begin recording, and click on something else to end. What you do in this case is supply a relatively small buffer to the API. When it's filled up with sound data, you'll receive an MM_WIM_DATA message. You copy the contents into another buffer or save it in some other way, and then send the buffer out again to continue receiving input.

How large should this buffer be? The WAVEEDIT program included with the Multimedia Developers Kit apparently uses a 16K buffer, which is sufficient to record about 1.5 seconds of audio at a 11.025-kHz sample rate and 1 byte per sample.

In the case of waveform output, you usually know the length of the sound data,

THE WAVEFORMAT AND PCMWAVEFORMAT STRUCTURES

```
typedef struct waveformat_tag
{
    WORD    wFormatTag ;           // waveform format
    WORD    nChannels ;           // number of channels
    DWORD   nSamplesPerSec ;       // sample rate
    DWORD   nAvgBytesPerSec ;      // bytes per second
    WORD    nBlockAlign ;         // block alignment
}
WAVEFORMAT ;

typedef struct pcmwaveformat_tag
{
    WAVEFORMAT wf ;
    WORD    wBitsPerSample ;      // bits per sample
}
PCMWAVEFORMAT ;
```

Figure 2: These structures are used with the waveInOpen and waveOutOpen function.

and you can allocate a buffer to hold all the data. This buffer may be greater than 64K. Or you can break the data into pieces and send it out in smaller buffers. In either case, you receive a MM_WOM_DONE message when the buffer is empty.

You'll need to call GlobalAlloc with the GMEM_MOVEABLE and GMEM_SHARE flags a second time to allocate space for a WAVEHDR structure, shown in Figure 3. Set the first field to the address of the data buffer, and the second field to the length of the buffer. For output, you can play a sound sequence in repetitive loops. In that case, you set dwLoops to the number of repetitions, and set dwFlags to WHDR_BEGINLOOP or WHDR_ENDLOOP to indicate the beginning or ending buffers in the loop.

The next step is to call one of the following functions:

```
waveInPrepareHeader (hWaveIn,
    pwavehdr, sizeof (WAVEHDR)) ;
```

```
waveOutPrepareHeader (hWaveOut,
    pwavehdr, sizeof (WAVEHDR)) ;
```

The first parameter is the waveform handle, the second is a pointer to the WAVEHDR structure, and the third is the size of the structure. Although these functions are not documented very well, I understand that they basically call GlobalPageLock for both the WAVEHDR structure and the buffer, preventing the buffers from being swapped out of memory on a 386.

For waveform input, you begin recording sound by first calling waveInAddBuffer and then waveInStart:

```
waveInAddBuffer (hWaveIn,
    pwavehdr, sizeof (WAVEHDR)) ;
waveInStart (hWaveIn) ;
```

The waveInStart function returns immediately and the recording of sound occurs in the background. When the buffer is full, you'll receive a MM_WIM_DATA message. The lParam message parameter is a pointer to the WAVEHDR structure and buffer by calling:

```
waveInUnprepareHeader (hWaveIn,
    pwavehdr, sizeof (WAVEHDR)) ;
```

The dwBytesRecorded field of the WAVEHDR structure will contain the number of bytes actually recorded, and you can copy the data from the buffer. You can then call waveInPrepareHeader again, followed by waveInAddBuffer. To stop recording, you call:

```
waveInStop (hWaveIn) ;
```

At that time, you'll receive a MM_WIM_DATA message for the buffer currently being used.

Waveform output is a little easier. After preparing the header, you call:

```
waveOutWrite (hWaveOut,
    pwavehdr, sizeof (WAVEHDR)) ;
```

to begin playing the sound in the buffer. This function returns immediately and the playing occurs in the background. You'll receive an MM_WIM_DONE message when the sound is finished playing. At that time you can unprepare the header:

```
waveOutUnprepareHeader (hWaveOut,
    pwavehdr, sizeof (WAVEHDR)) ;
```

You can fill the buffer with more sound data (if you want), prepare the header, and call waveOutWrite to play it.

Environments

Although I've described using only one WAVEHDR structure and one data buffer, you're certainly not limited to that. Internally, the waveform audio software maintains a chain of headers and buffers. For example, for waveform output, you can allocate multiple headers and buffers, prepare the headers, and pass them out with multiple successive waveOutWrite calls. As each buffer is finished being played, you get an MM_WOM_DONE message. At that point you can unprepare the header and free the memory.

You receive an MM_WIM_DATA message for each waveInAddBuffer call, and an MM_WOM_DONE message for each waveOutWrite call. Between the time of the function call and the time of the message, you should keep your hands off of the header and the buffer.

As I mentioned earlier, it's possible to loop between one or more buffers by setting the dwLoops and dwFlags fields in the WAVEHDR structure. When a loop is playing you can break out of it simply by calling:

```
waveOutBreakLoop (hWaveOut) ;
```

You'll receive an MM_WOM_DONE message for each of the buffers in the loop. Playing will continue with the next output buffer in the chain.

THE TAPE RECORDER METAPHOR

The waveform audio API uses a tape recorder metaphor for some other functions. At any time, you can get a current position from the beginning of the buffer chain in a variety of formats:

```
waveInGetPosition (hWaveIn,  
    &mmtime, sizeof (MMTIME)) ;
```

```
waveOutGetPosition (hWaveOut,  
    &mmtime, sizeof (MMTIME)) ;
```

The MMTIME structure is rather involved, but basically it lets you obtain a position in milliseconds, waveform samples, data bytes, or SMPTE time associated with video editing (measured in hours, minutes, seconds, and frames).

Just as a tape recorder has a pause button, you can pause the playing of sound by calling:

```
waveOutPause (hWaveOut) ;
```

You can restart the play from the paused position by calling:

```
waveOutRestart (hWaveOut) ;
```

The following two functions halt all activity and generate MM_WIM_DATA or MM_WOM_DONE messages for all pending buffers in the chain:

```
waveInReset (hWaveIn) ;
```

```
waveOutReset (hWaveOut) ;
```

These functions are quite important because the functions to close the device will fail if there are any pending buffers in the chain.

VOLUME, PITCH, AND PLAYBACK RATE

The dwSupport field of the WAVEOUTCAPS structure indicates whether waveform audio hardware is capable of volume, pitch, and playback rate control. (The Sound Blaster card does not support these features, so I haven't had an opportunity to experiment with them.)

Some waveform output hardware may support changing the volume of the sound while the sound is playing. If volume control is supported, you can obtain the current volume by calling:

```
waveOutGetVolume (hWaveOut,  
    &dwVol) ;
```

and set a new volume by calling:

```
waveOutSetVolume (hWaveOut,  
    dwVol) ;
```

In both of these cases, the low word is the right channel setting, the high word is left channel. If only one channel is being used, or the channel volumes cannot be independently changed, only the right channel volume is present. The volume values range from 0x0000 (silence) to 0xFFFF (maximum).

Some waveform output devices may allow obtaining and changing the playback rate:

```
waveOutGetPlaybackRate (hWaveOut,  
    &dwRate) ;
```

```
waveOutSetPlaybackRate (hWaveOut,  
    dwRate) ;
```

The playback rate is interpreted as a fixed-point value, with the integer part in the high word and the fractional part in the low word. (I assume the default is 1.0 or 0x10000.) Changing the playback rate is equivalent to speeding up or slowing down a tape recorder. The playback rate doesn't change the sample rate, but does affect the time required to play the sound. Changing the playback rate will also affect the pitch of the sound, just like a tape recorder.

A more complex feature allows obtaining and changing a pitch setting:

```
waveOutGetPitch (hWaveOut,  
    &dwPitch) ;
```

```
waveOutSetPitch (hWaveOut,  
    dwPitch) ;
```

The pitch value is also interpreted as a fixed point value. Changing the pitch does not affect the sampling rate or the playback rate. Conceivably, for boards supporting this feature, you can increase the playback rate and decrease the pitch settings so that the sounds are faster without being higher in frequency.

ERROR HANDLING

Every waveform audio function except waveInGetNumDevs and waveOutGetNumDevs returns 0 if the function is successful and a nonzero error code otherwise. In the case of waveInOpen and

THE WAVEHDR STRUCTURE

```
typedef struct wavehdr_tag  
{  
    LPSTR lpData ;           // buffer pointer  
    DWORD dwBufferLength ;   // buffer length  
    DWORD dwBytesRecorded ;  // returned data length  
    DWORD dwUser ;           // program-defined  
    DWORD dwFlags ;          // flags  
    DWORD dwLoops ;          // loop counter  
    struct wavehdr_tag far *lpNext ; // reserved  
    DWORD reserved ;         // reserved  
}  
WAVEHDR ;
```

Figure 3: Use this structure to send buffers to the waveform audio API.

Environments

waveOutOpen, you should definitely check if the function is successful. It could be that another program already has the device open, or that the waveform format you request is not available.

For many other functions, the only documented error code is for an invalid handle. Thus, if your code doesn't have bugs that cause you to lose the handle, you really don't have to check for an error code. You'll probably have your hands full checking for memory allocation errors anyway.

If you want to display an error to the user in a text form, you can call:

```
waveInGetErrorText (wError,  
pBuffer, wBufferLength) ;
```

```
waveOutGetErrorText (wError,  
pBuffer, wBufferLength) ;
```

The pBuffer parameter is a pointer to a character buffer. On return it will be filled with a zero-terminated text string of less than 80 characters.

CLOSING DOWN

Finally, when you're all finished using the waveform audio hardware, you should close the device:

```
waveInClose (hWaveIn) ;
```

```
waveOutClose (hWaveOut) ;
```

If there are pending buffers in the chain, you must call waveInReset or waveOutReset before closing the device. This can get tricky; you don't want to simply call the reset and close functions in succession because then the waveform handle won't be valid during the MM_WIM_DATA or MM_WIM_DONE messages. The sample programs shown in this column will attempt to solve this problem.

What you shouldn't do is open a waveform device when your program starts up and close it when it terminates. This bad behavior prevents other programs from using the waveform hardware during the time your program is running.

In the next issue, we'll write a tape recorder program, not quite as sophisticated as the WAVEEDIT program included in the Multimedia Developers Kit, but instructive anyway. ■

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CIRCLE 497 ON READER SERVICE CARD

by
Ray Duncan

Power Programming

Optimizing Assembly Language Programs, Part 2

In the last installment of this column, we talked about some global optimization issues, and then surveyed the tradeoffs inherent in optimizing a program for size or speed. In this issue and the next, we'll look more closely at a sampling of the classic "local" optimizations. But it's important to remember that these specialized techniques should be used only in specialized circumstances—that is, *after* you've made sure you're using the right algorithms and data structures, you've debugged the program completely, and you've employed profiling tools to pin down the exact code sequences that are limiting performance.

STRENGTH REDUCTION

Multiplication and division operations are expensive on just about any CPU, because they must be implemented (at some level) in terms of shifts and adds or shifts and subtracts respectively. The original 4-bit and 8-bit microprocessors didn't have machine instructions for multiplication or division, so programs carried out those operations in lengthy subroutines that performed the shifts and adds or subtracts explicitly. The early 16-bit microprocessors such as the 8086 and the 68000 did offer multiplication and division in hardware, but the instructions were almost unbelievably slow: A 32-bit by 16-bit division on the 8086, for instance, required approximately 150 machine cycles.

Thus, the little tricks for speeding up or eliminating multiplication and division operations were, and still are, among those first learned by any performance-minded programmer. Most of these tricks fall into a category of techniques known as *strength reduction*—the replacement of general-purpose multiply or divide instructions (or subroutine calls) with specialized sequences of shifts and adds or subtracts.

Let's look at the simplest optimizations for multiplication first. To multiply a number by a power of 2, you merely shift it left by the appropriate number of

■ When you've done what you can on a global level to optimize your program, you need to resort to classic code tightening and cycle shaving to improve your program's performance. Here's a look at some common techniques.

bit positions. For example, here's some generalized but pokey code that multiplies the value in the variable *myvar* by 8:

```
mov     ax, myvar
mov     bx, 8
mul     bx
mov     myvar, ax
```

This code can be transformed (on 8086/88 processors) into the sleeker sequence:

```
mov     ax, myvar
shl     ax, 1      ; *2
shl     ax, 1      ; *4
shl     ax, 1      ; *8
mov     myvar, ax
```

or, alternatively

```
shl     myvar, 1
shl     myvar, 1
shl     myvar, 1
```

If you're only shifting the value one or

two positions, it's usually cheaper to shift the value in memory; if you need to shift the value many positions, the increased speed of in-register shifting will pay you back for the additional instructions required to load the value into a register first and then store it back afterward.

But wait—even this simple optimization is not as straightforward as it first appears! The 80x86's instruction prefetch queue, the particular model of Intel CPU you're running on, and the presence or absence of a cache can interact in strange and wonderful ways. At some point and on some CPUs, it becomes worthwhile to use the "shift by count in CX" variant of the instruction:

```
mov     ax, myvar
mov     cx, 3
shl     ax, cl
mov     myvar, ax
```

And the 80186 and later CPUs have a "shift by immediate count" variant that is even more convenient:

```
shl     myvar, 3
```

If you need to multiply values that are larger than 16 bits by powers of 2, you can use the CPU's carry flag to propagate the shift through multiple registers. For example, to multiply the 32-bit value in DX:AX by 4, you could write

```
shl     ax, 1      ; *2
rcl     dx, 1
shl     ax, 1      ; *4
rcl     dx, 1
```

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By creatively combining shifts and adds, you can perform fast special-case multiplication by just about any value. The following code multiplies the value in register AX by 10:

```
mov    bx,ax    ; save copy
shl    ax,1     ; *2
shl    ax,1     ; *4
add    ax,bx    ; *5
shl    ax,1     ; *10
```

The application of strength reduction to division is somewhat more limited. Dividing by powers of 2 is, of course, very easy. You merely shift the value right, making sure to choose the appropriate shift instruction for the type of division (signed or unsigned) desired. For example, to perform an unsigned division of the value in AX by 4, you would write

```
shr    ax,1
shr    ax,1
```

or, on 80186 and later CPUs, you could use instead

```
shr    ax,2
```

To perform a signed division by 4, you would write

```
sar    ax,1
sar    ax,1
```

or on 80186 and later CPUs

```
sar    ax,2
```

The only difference between the logical (or unsigned) shift instruction SHR and the arithmetic (or signed) instruction SAR is that SHR copies the most significant bit into the next lower bit and then replaces the most significant bit with 0, while SAR copies the most significant bit into the next lower bit but leaves the most significant bit unchanged.

Selecting the correct shift instruction for fast division is very important, particularly when you're dealing with addresses. If you accidentally use signed arithmetic on an address when you meant to use unsigned, the bug may bite you immediately—but it may also remain latent until some change in the size or linking

order of the application unmasks the error at a later date. (Incidentally, there are parallel SHL and SAL mnemonics, but they assemble into the same machine instruction—think about it.)

Multiple-precision division by powers of 2 with shifts can be accomplished with the aid of the carry flag, and is no more difficult than multiple-precision multiplication. For example, to perform a signed divide of the value in DX:AX by 8, you could code

```
sar    dx,1     ; /2
rcr    ax,1
sar    dx,1     ; /4
rcr    ax,1
sar    dx,1     ; /8
rcr    ax,1
```

But unlike multiplication, fast division by arbitrary values such as 3 or 10 rather than powers of 2 using shifts is surprisingly messy. If you take the trouble to implement a fast divide-by-10 sequence analogous to the multiply-by-10 method shown above, you'll soon find that you've got a lengthy, slow chunk of code, and furthermore, that you've done 90 percent of the work for a generalized software division routine using shifts and subtracts. It's usually more profitable to rethink the whole situation instead, and transform the algorithm or data structure so that division by odd values isn't necessary.

I shouldn't move on from this topic without mentioning a nifty optimization that is attributed to Mark Zbikowski, one of the authors of MS-DOS Versions 2.x and 3.x. The code below divides the value in register AX by 512:

```
shr    ax,1
xchg    ah,al
cbw
```

Once you've seen it, this clever sequence naturally leads the mind to all sorts of special-purpose sequences of XCHG or MOV instructions that yield multiplication or division by relatively large powers of 2: 256, 512, and so on.

JUMP AND CALL OPTIMIZATIONS

Spaghetti code—code that is poorly organized and is infested with branches in all directions—is always undesirable, but it carries a particularly harsh penalty on Intel 80x86 CPUs. This is perhaps a blessing, because it provides a powerful incentive for assembly language program-

mers and the designers of optimizing compilers to structure their code properly, but it does introduce some interesting problems. Before we discuss jump and call optimizations, let's review some of the characteristics of Intel hardware.

For much of its performance, the Intel architecture relies on a simple pipelining scheme with three components: a bus interface unit (BIU), a prefetch queue, and an execution unit (EU). Whenever the memory bus is idle (for example, during the execution of a multicycle instruction whose operands are in registers), the BIU fetches instruction bytes from memory and places them in the prefetch queue, working forward sequentially from the current value of the CPU's instruction pointer (IP). As the EU completes each instruction, it looks first in the prefetch queue for the next instruction; if the instruction is in the queue, the EU can proceed immediately to decode the instruction without waiting for a memory access.

How do jumps and calls interact with this simple implementation of pipelining? Whenever the EU decodes a jump or call instruction, it invalidates the complete contents of the prefetch queue and reloads the IP. The BIU must then start from scratch to fetch instruction bytes from the new execution address and load them into the prefetch queue, while the EU must "stall" until a complete instruction has been retrieved. Then, any memory accesses that are involved in the execution of that first instruction at the new address will interfere with the BIU's ability to prefetch the subsequent instruction, and so on. It may be quite a while before the BIU can completely fill the prefetch queue again so that the EU can run at its maximum speed.

To further complicate the situation, the size of the prefetch queue varies from one CPU model to another. It's as small as 6 bytes on early models, and as large as 32 bytes on recent ones. This is one of the factors that makes predicting execution times for particular sequences of instructions, based on instruction cycle counts and byte lengths, quite difficult. Additionally, the dependence of the prefetch queue on instruction "alignment" varies among the CPU models. The BIU must fetch instructions on address boundaries and in multiples of bytes that are dictated by the width of the CPU's external memory bus, and the performance of the prefetch queue can be significantly impaired when

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the targets of calls or jumps lie at the "wrong" addresses. For example, on an 8086 CPU with a 16-bit memory bus, the CPU always fetches instructions from memory 16 bits at a time, so if the instruction that is the target of a jump or call begins on an odd address, one half of the first memory access to fetch the instruction at that address will be wasted.

Which leads us to the first guideline for optimizing jumps and calls: Make sure their destinations fall on the proper address boundaries for the type of CPU your application will run on most often. You do this by adding the appropriate alignment attribute (WORD or DWORD) to your segment declarations, and inserting ALIGN directives before each label. The 8088 has an 8-bit external bus, so it is not sensitive to alignment at all; if your program's market is primarily 8088-based PCs, you should avoid alignment altogether because it will just waste memory without affecting performance.

On the other hand, if your program is mainly going to run on 8086 or 80286 CPUs, you should align everything on WORD boundaries, while if your program is specific to 80386DX or 80486DX CPUs you should use DWORD alignment. (The 80486 actually prefers items to lie at 16-byte boundaries, due to the structure of its internal cache, but wasting an average of 8 bytes at each instruction label for the sake of alignment seems to me like an awful lot to give away.)

The next rule of thumb for jumps and calls is simply to eliminate them whenever possible—at least in those portions of your program that are CPU-bound. Toward this end, you want to organize your code so that it executes in a straightforward, sequential manner with the minimum number of decision points. This will tend to keep the prefetch queue full and will also make your code easier to read, maintain, and debug. Once you've obtained as much improvement as you can with "good" code structuring, you must decide whether you need to go further and introduce "bad" structure in the name of performance, such as converting jumps to a common subroutine exit point into multiple exits. In extreme cases, short subroutines can be converted to macros and expanded "in-line" to avoid the overhead of a call and return.

When your code needs to make a conditional jump, analyze the decision point and structure your code so that the jump will be taken on the less-common case, thus minimizing the number of times that the prefetch queue must be dumped. For example, if your code is checking a variable for a negative value, but the value would only be negative under unusual circumstances, design your code to "fall through" the branch when the value is positive:

```
cmp balance,0
jl  in_the_red ; rarely happens
```

Similarly, if you've got a value that can trigger many different actions, and you're making multiple comparisons followed by conditional branches based on this

One rule of thumb for jumps and calls is simply to eliminate them whenever possible—at least in those portions of your program that are CPU-bound.

value, try to move the comparisons for the most-common cases to the front:

```
cmp ax,most_common_value
jne L1
.
.
jmp L3
L1: cmp ax,less_common_value
jne L2
.
.
jmp L3
L2: cmp ax,least_common_value
jne L3
.
.
L3:
```

If you're testing for many values and they

are sparsely arranged, you can implement the multiway comparison much like a binary search, first bisecting the range of possible values by checking whether the value being tested is the same as, greater than, or less than the middle value, then (if less or greater) bisecting the remaining range with another comparison, and so on. This strategy is extremely efficient if the values are sparse and fairly uniformly distributed. If the values are not sparse, the best solution is often a "jump table." For example, imagine that we have an ASCII character in AL, we have an assortment of routines that perform special processing for certain character values, and we want to get to those routines quickly without explicitly comparing for each possible character value. We first construct a table containing the address of the appropriate routine in the slot corresponding to the character's ASCII code, and we then branch through the table as follows:

```
table dw routine_00
      dw routine_01
      .
      .
      dw routine_FE
      dw routine_FF
      .
      .
;copy char to BL
mov bl,al
;form index to table
xor bh,bh
;and jump "through" table
shl bx,1
jmp [table+bx]
```

Two more optimizations that are related to jumps and calls and require a certain amount of "destructuring" of an otherwise valid program are *tail merging* and *tail recursion elimination*. Both involve the transformation of calls into jumps; calls are inherently more expensive than jumps because they push a return address onto the stack and thus require more memory accesses. Tail merging is simply the conversion of a CALL instruction followed immediately by a RETurn instruction into a JMP instruction. That is, a sequence such as

```
procl proc near
.
.
call proc2
```


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```
    ret
proc1 endp

proc2 proc near
.
.
.
    ret
proc2 endp
```

is converted to the faster sequence

```
proc1 proc near
.
.
.
    jmp proc2
proc1 endp

proc2 proc near
.
.
.
    ret
proc2 endp
```

After this optimization is implemented, because the return address of the caller of PROC1 is on the stack at entry to PROC2, the PROC2 procedure returns directly to the original caller, eliminating the overhead of extra CALL and RETURN instructions. If the code for PROC2 physically follows the code for PROC1, even the JMP PROC2 can be excised and the execution of PROC1 can just fall through into PROC2.

Tail recursion elimination is much like tail merging. When a routine calls itself recursively, and this call is located just before the routine's final return, the call can be converted to a jump, thereby both increasing speed and reducing the amount of stack space needed. For example, the code

```
proc1 proc near
.
.
.
    cmp ax, some_value
    je exit
    call proc1
exit: ret
proc1 endp
```

can be transformed to

```
proc1 proc near
.
.
.
    cmp ax, some_value
    jne proc1
    ret
proc1 endp
```

Such recursive routines can often be optimized even further by converting the recursion into a loop.

COMING ATTRACTIONS

In the next issue we'll continue our discussion of classic assembly language optimizations with an examination of common loop optimizations and some CPU-dependent optimizations.

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by
Fran Finnegan

Windows

SMALL FONTS ON BIG SCREENS

I use a 20-inch NEC MultiSync 5D monitor with an ATI VGA WonderPlus card, at a resolution of 1,024 by 768 pixels. When I installed the *Windows* 3.0 ATI display driver, it chose the 8514 system fonts (8514-FIX.FON, 8514SYS.FON, and 8514OEM.FON) for pull-down menus and the various system programs such as the File Manager. These fonts are larger than the VGA fonts, but since 8514 fonts are displayed on a 1,024-by-768 screen while VGA fonts use a 640-by-480 display, the two fonts appear about the same relative size when they are used in their respective modes.

My screen is quite large, though, and the default 8514 fonts use up more space than I like. By using the lower-resolution VGA fonts on this monitor, I'm able to get more data on-screen and, because the screen is big, it's still readable.

Changing the system fonts doesn't seem to be documented, but it's easy. First, make sure you have the required

■ **SMALL FONTS ON BIG SCREENS:** Display more text on-screen by changing your default fonts.

■ **EASIER-TO-READ HELP TEXT:** Use two undocumented WIN.INI entries to change the colors of the Help hypertext strings.

fonts in your *Windows* SYSTEM directory. The VGA fonts are called VGAFIX.FON, VGASYS.FON, and VGAOEM.FON. If these fonts are not present, an experienced user can extract them from the *Windows* installation disks using the Expand program.

It's much simpler, however, to run the

Windows Setup program and configure the display as a VGA monitor. This causes the VGA fonts to be installed from the *Windows* disks. Now run Setup again and configure the display for 1,024 by 768 using the *Windows* driver that accompanies your graphics board.

Next you need to modify the SYSTEM.INI file. You do this by changing the following lines:

```
[boot]
fixedfon.fon=8514fix.fon
fontsfon=8514sys.fon
oemfontsfon=8514oem.fon
```

to:

```
[boot]
fixedfon.fon=vgafix.fon
fontsfon=vgasys.fon
oemfontsfon=vgaohm.fon
```

After you restart *Windows*, you'll be using the relatively small VGA fonts on a 1,024-

THE [DISPLAY] SECTION OF SETUP.INI

[display]

; The string following the driver description specifies the screen
; resolution. It is used to match the system and OEM character sets
; with the display selection.

;profile	- driver,	Description of driver,	resolution,
;8514	= 1:8514.drv,	"8514/a",	"100,120,120",
cga	= 1:cga.drv,	"CGA",	"200,96,48",
;plasma	= 1:plasma.drv,	"Compaq Portable Plasma",	"100,96,96",
egahires	= 1:ega.drv,	"EGA",	"133,96,72",
egahibw	= 1:egahibw.drv,	"EGA black and white (286 only)",	"133,96,72",
;egamono	= 1:egamono.drv,	"EGA Monochrome (286 only)",	"133,96,72",
;hercules	= 1:hercules.drv,	"Hercules Monochrome",	"133,96,72",
mcga	= 1:vgamono.drv,	"IBM MCGA (286 only)",	"100,96,96",
;olibw	= 1:olibw.drv,	"Olivetti/AT&T Monochrome or PVCDisplay",	"120,96,80",
;sv488a	= 1:sv488a.drv,	"Olivetti OEC Color Display or AT&T VDC750",	"120,96,80",
;ct441	= 1:vga.drv,	"QuadVGA, ATI VIP VGA, 82C441 VGAs",	"100,96,96",
vga	= 1:vga.drv,	"VGA",	"100,96,96",
vgamono	= 1:vgamono.drv,	"VGA with Monochrome display",	"100,96,96",
;v7vga	= 1:v7vga.drv,	"Video Seven VGA with 512K",	"100,96,96",
dgis3hi	= a:dgis3hi.drv,	"DGIS3.x High Resolution (8514/a), v2.01",	"100,120,120",
dgis3lo	= a:dgis3lo.drv,	"DGIS3.x Medium Resolution (SVGA), v2.01",	"100,96,96",
;dgis3him	= a:dgis3hi.drv,	"DGIS3.x High Resolution w/Hercules, v2.01",	"100,120,120",
;dgis3lom	= a:dgis3lo.drv,	"DGIS3.x Medium Resolution w/Hercules, v2.01",	"100,96,96",



Figure 1: This shows the first four columns of the [display] section of a fairly typical SETUP.INI file.

Windows

DEFAULT FONT FILES DETERMINED BY SETUP.INF					
.FON Files					
Mode:	CGA	EGA	VGA	SVGA	8514/a
Resolution:	640x200	640x350	640x480	800x600	1,024x768
Pixel aspect ratio:	2:1	1.33:1	1:1	1:1	1:1
Resolution string values:					
Aspect ratio percent	200	133	100	100	100
Horizontal pixels/inch	96	96	96	96	120
Vertical pixels/inch	48	72	96	96	120
Special-purpose fonts:					
SYSTEM.INI [boot]					
fixedfon.fon=	CGAFIX	EGAFIX	VGAFIX	VGAFIX	8514FIX
fontsfon=	CGASYS	EGASYS	VGASYS	VGASYS	8514SYS
oemfontsfon=	CGAOEM	EGAOEM	VGAOEM	VGAOEM	8514OEM
General-purpose fonts:					
WIN.INI [fonts]					
Helv 8,10,12 ...=	HELVA	HELVB	HELVE	HELVE	HELVF
Courier 10,12,15 ...=	COURA	COURB	COURE	COURE	COURF
Tms Rmn 8,10,12 ...=	TMSRA	TMSRB	TMSRE	TMSRE	TMSRF
Symbol 8,10,12 ...=	SYMBOLA	SYMBOLB	SYMBOLC	SYMBOLC	SYMBOLF

Figure 2: These default font (.FON) files are installed by the *Windows* SETUP program based upon the resolution string in *SETUP.INF*.

by-768 display. Thus, if you use a large monitor, you'll be able to see a lot more information on-screen.

You can make the system font even smaller using the EGA fonts, if you can stand the small print.

Robert Patterson
Calgary, Alberta
Canada

PC There's an even easier way to do all this! It involves editing the [display] section of your *SETUP.INF* file. *SETUP.INF* determines what the *Windows* Setup program puts in your *SYSTEM.INI* and *WIN.INI* files. If you make changes only to *SYSTEM.INI* and *WIN.INI*, you run the risk that those changes will be overridden the next time you run Setup. You should be able to find the *SETUP.INF* file (and an *OEM-SETUP.INF* file that may come with your graphics adapter) in your *Windows* *SYSTEM* directory. (If you do edit your *SETUP.INF*, be sure to make a backup beforehand.)

SETUP.INF establishes the default fonts for a particular driver. If you don't like the size of these fonts, you can change the default. To explain how to change your default fonts easily, I'll refer to the tables in Figures 1 and 2.

Figure 1 shows a truncated version of the [display] section of one of my *SETUP.INF* files, which is fairly typical. (For clarity, I've included only the first four columns.) You'll note that several lines begin with leading semicolons, which comment out modes or drivers not supported by any of my 1,024-by-768 graphics boards, so the lines can't accidentally be used by the Setup program. (Commenting out drivers that are not compatible with your graphics board is a safety precaution I highly recommend if you often use Setup to switch between display modes, which I do. I learned this lesson the hard way, by choosing the wrong driver once; I had to reinstall *Windows* completely afterward.)

The column labeled *resolution* is the most important part of Figure 1 to examine. Within the quotes, the second and third numbers indicate the standard horizontal pixels per inch and vertical pixels per inch of the display driver respectively, while the first number is the ratio of those two expressed as a percentage. These numbers determine the fonts that Setup will automatically install for you. They are cross-references to other parts of *SETUP.INF*, specifically the font-file sections: [sysfonts], [fixedfonts], [oemfonts] and [fonts].

I've combined the information in these sections to create Figure 2, which shows the default fonts Setup installs based on the original resolution strings from *SETUP.INF* as indicated in Figure 1. The special-purpose fonts come from the [sysfonts], [fixedfonts], and [oemfonts] sections of *SETUP.INF*, and get inserted into the *SYSTEM.INI* [boot] section. The general-purpose fonts come from the [fonts] section, and are placed in the *WIN.INI* [fonts] section. If you do *not* change *SETUP.INF*, these are the default fonts for the various standard resolutions.

So how could Mr. Patterson change his default fonts from the 8514 variety to those for the VGA? By simply changing the resolution string on the line that begins with 8514= in the [display] section of his *SETUP.INF* from:

"100, 120, 120"

to that of the vga= line:

"100, 96, 96"

To effect this change, save the *SETUP.INF* file and run the Setup program twice from within *Windows*. Change to VGA resolution the first time, then change back to 8514. Setup will see only the change when it is moving you into the new (changed) resolution, which is why you have to run Setup twice.

After making this single change to *SETUP.INF*, Patterson could freely change to other resolutions and still get VGA fonts whenever he changes back to his 8514 resolution. Setup will have updated *SYSTEM.INI* and *WIN.INI* the way he would want it to.

And to experiment with relatively smaller EGA fonts in 8514 resolution, simply change the resolution string on the 8514= line to:

"133, 96, 72"

VGA users can also apply this concept. If you want to get more text lines on your screen, you can use EGA fonts (which have fewer pixels vertically, and are therefore shorter). On your vga= line, simply change:

"100, 96, 96"

to:

"133, 96, 72"

Windows

Then run Setup twice, first going to EGA, and then back to the new VGA setting.

If you'd rather not modify SETUP.INF manually, you can follow Patterson's suggestions, but you'll want to go one step further. Patterson didn't change his WIN.INI file to reference the smaller general-purpose raster fonts that come in VGA resolution. His WIN.INI file should also be modified, by changing these lines:

```
[fonts]
Helv 8,10,12,14,18,24 (8514/a
res)=HELVF.FON
Courier 10,12,15 (8514/a
res)=COURF.FON
Tms Rmn 8,10,12,14,18,24 (8514/a
res)=TMSRF.FON
Symbol 8,10,12,14,18,24 (8514/a
res)=SYMBOLF.FON
```

to these:

```
[fonts]
Helv 8,10,12,14,18,24 (VGA
res)=HELVZ.FON
Courier 10,12,15 (VGA
res)=COURZ.FON
Tms Rmn 8,10,12,14,18,24 (VGA
res)=TMSRZ.FON
Symbol 8,10,12,14,18,24 (VGA
res)=SYMBOLZ.FON
```

Without conforming these general-purpose fonts with the size of his special-purpose system fonts, applications may get confused. This is especially true of applications that allow you to choose various fonts. The main symptom of mismatched special- and general-purpose fonts is having text show up on your screen with weird-looking spacing or character truncation when you mix typefaces.

EASIER-TO-READ HELP TEXT

Here's a tip I picked up from a programmer friend. If you're going nuts trying to read the pale green *Windows* help text, you can add these parameters to the [Windows Help] section of your WIN.INI file:

```
[Windows Help]
JumpColor=0 0 0
PopupColor=0 0 0
```

These entries do not already exist; you have to add them manually. The numbers represent the intensity values of red, green, and blue respectively. In this case, the help text would be black—perfect for laptops with LCD screens that emulate VGA. With this technique I've been able to put away my magnifying glass.

Todd E. Henschell
Burbank, California



As users of *Windows*' Help system know, the pale green text has special hypertext-like meaning. The solid underlined green text represents a topic that Help will *jump* to when you click on it. The dotted underlined

The main symptom of mismatched special- and general-purpose fonts is having text show up on your screen with weird-looking spacing or character truncation when you mix typefaces.

green text indicates a subject that is described in more detail in a *pop-up* window. (Click on the text and hold the mouse button down in order to display the window.) In both cases, the mouse cursor changes to the shape of a hand when it is placed over these text strings. However using Help is annoying because these pale green text strings are extremely difficult to read, especially on laptops and monochrome monitors.

The red, green, and blue (RGB) entries described by Mr. Henschell operate in the same way as the RGB entries in the [Colors] section of WIN.INI. The values for each RGB color component can range from 0 to 255, but you can't use the Control Panel to enter or set them. Unfortunately, you have to enter or change

them manually and then restart *Windows* for the change to take effect. (You could change WIN.INI manually *within Windows* and have the changes take effect immediately if you use the WININI.EXE program described in the July 1991 *Windows* column.) By default, the pale green entries for Help hypertext are RGB 0 255 0, meaning that green is at full intensity, which is why it is almost indistinguishable from white and seems pale.

If you choose black, you'll have to rely on the two kinds of underlining to distinguish the hypertext hot spots. Since it's possible to set these two WIN.INI entries to any valid RGB setting, I've chosen the following settings for my color monitors:

```
[Windows Help]
JumpColor=128 0 0
PopupColor=0 0 128
```

These settings give me dark red for jumps and dark blue for pop-ups. That way I have darker colors rather than the pale green, and I don't have to rely on the underlining to notice the hot spots. I can also easily tell which type of hot spot I'm looking at.

You don't need to be concerned about adding any undocumented entries to your WIN.INI file. At worst they'll be ignored by some future version of an application, and they take up only a small amount of memory.

If you're curious as to where the "JumpColor" and "PopupColor" strings are located in the Help program, use a binary-file editor to look at offset 89326 (15CEE hexadecimal) in the *Windows* 3.0 version of the WINHELP.EXE file. Near them you'll notice similar "Font" and "MacroColor" strings, but I haven't been able to figure out what they are used for. In any case, you can't change the pale green color of the annotation paperclips if you make Help annotations.

OPENING WINDOWS

Share your *Windows* experiences with Fran Finnegan; we'll pay you \$50 for any tip we print. Mail your contribution on-disk, with a printout, to *Windows*, PC Magazine, One Park Avenue, New York, NY 10016, or e-mail it (re: PC Magazine) to: PC MagNet: 76244.145; MCI Mail: Fran Finnegan; BIX: franfinnegan; GENIE: finnegan; Internet: finnegan@well.sf.ca.us. We regret that we are unable to acknowledge submissions or answer letters individually.

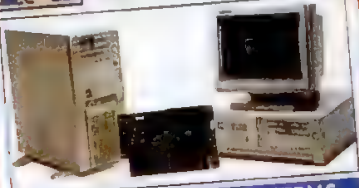
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by
Sal Ricciardi

Databases

GETTING FAST HELP

For someone developing database applications today, there's a lot of information to keep track of—things like programming language syntax, function-call semantics, API interface conventions, return codes, and so on. Having to wade through heavy manuals in order to find the information is a nuisance. And locating the right data *quickly* can sometimes seem like an impossible task.

That's why having on-line access to reference information can be a real productivity booster. The *Norton Guides*, now sold by Brady Software, gives you immediate pop-up access to reference information stored in .NG (Norton Guide) files. And many vendors of database products, libraries, and APIs have available custom .NG files to support their products. For example, Nantucket supplies .NG files with *Clipper 5.0*.

However, the *Norton Guides*' TSR requires nearly 72K of RAM and doesn't support enhanced video modes, like the 132-column modes provided by *Personics Corp.*'s *UltraVision*. As a result, my copy of the *Norton Guides* Engine has remained unused for years.

Enter the *Expert Help Hypertext Sys-*

■ **GETTING FAST HELP:**
A TSR lets you access
your *Norton Guides* files
more efficiently.

■ **IGNORING ESC:**
Disable Esc or other
keys during READs or
pop-ups in *FoxPro*.

■ **DELETING WITH
WILDCARDS:** A
procedure that lets you
use wildcards when
deleting files within
FoxPro's command
window.

tem from SofSolutions (see Figure 1). *Expert Help* is a memory-resident search engine that reads and displays information from *Expert Help* and *Norton Guides* databases. It's compatible with all *Norton Guides* (.NG) files, and it can require as little as 1K of RAM on a system equipped with EMS. It also works correctly in ex-

tended video modes on systems that support them.

Expert Help has a pull-down menu interface to access your hypertext databases and program functions. Within any database entry, a pull-down menu shows available related topics (or *see-also* references). This makes jumping between related entries easy.

The product lets you cut and paste text directly from a hypertext database into your program. This means you can copy a command example directly from the database into your source code, reducing the possibility of syntax errors. You can also cut and paste directly from the database to your printer for quick printouts.

The *Expert Help Hypertext System* is a handy tool for *Clipper* owners and anyone else who has .NG files to access. If you'd like more information, call SofSolutions at 800-325-6820.

IGNORING ESC

I have discovered some interesting undocumented facts about *FoxPro 1.02*. I wanted to trap the Esc key during a READ so that it would not cause the READ to terminate. I've also wanted the ability to disable the Esc key while a pop-up is active. As it turns out, the command

```
ON KEY LABEL ESC *
```

tells *FoxPro* to ignore the Esc key.

This can also be used to disable other keys. For example, if the Left Arrow or Right Arrow key is used while a pop-up is active, normally the pop-up is exited. To prevent this from happening,

```
ON KEY LABEL LEFTARROW *
```

and

```
ON KEY LABEL RIGHTARROW *
```

can be used to disable these keys.

David M. Halpern
Santa Cruz, California

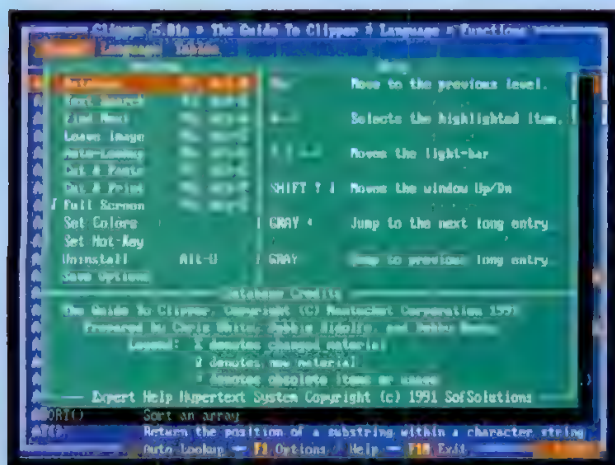


Figure 1: *Expert Help* lets you pop up a hypertext database in .NG format and cut and paste information directly into your editor. It uses only 1K of RAM when EMS is available.



One way to include comments in *FoxPro* source code is to start a line with an asterisk. The asterisk tells *FoxPro* that the line is a comment and therefore should be ignored.

FoxPro's ON KEY LABEL command tells *FoxPro* to execute the named command whenever a certain key is pressed. What sometimes isn't obvious is that the named command can be a *FoxPro* comment. This, in effect, tells *FoxPro* to process the comment whenever the specified key is pressed. Since "processing the comment" entails doing nothing, that's what happens when the key is pressed.

This can be very useful for disabling certain keys temporarily. As Mr. Halpern suggests, you can use this technique to disable the Esc key during an active READ. It can also come in handy to prevent the Esc key from terminating a BROWSE. Simply precede the BROWSE with the line:

```
ON KEY LABEL ESC *.
```

To reverse this process and turn the Esc key back on, you must use

```
ON KEY LABEL ESC
```

with no command specified.

Note that you can use this same technique in *FoxPro*, Version 2.0.

DELETING WITH WILDCARDS

One shortcoming in the *FoxPro* language is that the commands DELETE FILE and ERASE do not support wildcards. Jumping to DOS to issue the DEL command is slow and requires a lot of memory. Therefore, I wrote a routine to delete a group of files based on a wildcard expression.

The procedure (shown in Figure 2) works a lot like the DOS DEL command. However, it does not support wildcard expressions that have a drive specification and no path (for example A:.*). Run the procedure by typing:

```
DO DEL WITH <wildcard expression>
```

The <wildcard expression> can be either a character variable or a literal enclosed in quotes.

Kevin J. David
Toledo, Ohio

DEL1.PRG AND DEL.PRG

COMPLETE LISTING

```
*****
* DEL1.PRG                                     FoxPro 1.02
* Delete all files specified by a wildcard expression.
*
* Example: DO Del WITH "c:\*.bak"
*****
PROCEDURE DEL
PARAMETERS mWild
PRIVATE mPath, mFile

mPath = LEFT( mWild, RAT("\",mWild) )    ** Extract path
IF (" " = mPath .AND. AT(":",mWild) <> 0) ** If drive is specified
RETURN                                     ** Without a full path
ENDIF                                     ** Simply return
                                           ** Otherwise
mFile = SYS( 2000, mWild )                ** Find first matching file.
DO WHILE ! EMPTY( mFile )                 ** Was a matching file found?
ERASE ( mPath+mFile )                     ** Yes, delete it.
mFile = SYS( 2000, mWild, 1 )             ** Find next matching file.
ENDDO                                     ** Repeat process.

RETURN

*****
* DEL.PRG                                     FoxPro 2.0
* Delete all files specified by a wildcard expression.
*
* Example: DO DEL WITH "c:\*.bak"
*****
PROCEDURE DEL
PARAMETERS mWild
PRIVATE mPath, mFile

mWild = FULLPATH(mWild)                  ** Construct full path

mPath = LEFT( mWild, RAT("\",mWild) )    ** Extract path
mFile = SYS( 2000, mWild )                ** Find first matching file.
DO WHILE ! EMPTY( mFile )                 ** Was a matching file found?
ERASE ( mPath+mFile )                     ** Yes, delete it.
mFile = SYS( 2000, mWild, 1 )             ** Find next matching file.
ENDDO                                     ** Repeat process.

RETURN
```

Figure 2: The DEL1 (for *FoxPro* 1.02) and DEL (for *FoxPro* 2.0) programs make it easier to delete a group of files from the *FoxPro* command window.



This can come in handy when you're working in the *FoxPro* command window. During development, the repetitive compile/debug/edit cycle can leave quite a few .BAK files cluttering up your disk. Having to delete each one individually can take a lot of time. And jumping to DOS seems like a lot of work for such a common task.

Using this routine, you can delete all those .BAK files at once. The first version shown in Figure 2, DEL1.PRG, does not handle a wildcard containing a drive without a directory (like C:.*). Therefore, you should always pass this routine a complete drive and directory. For example, use C:*.BAK, not C:.*.BAK.

I added a few lines to Mr. David's original to check whether the passed parameter includes a drive without a directory. If it does, the procedure will simply return, ignoring your request.

The second procedure in Figure 2 is

for use with *FoxPro* 2.0. This version will work with any path specification, thanks to *FoxPro* 2.0's new FULLPATH function. This function returns a fully qualified path specification based on the parameter you pass it. For example, if you pass it C:.*, and the current directory on drive C is DOCS, FULLPATH will return C:\DOCS*.*.

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by
Craig Stinson

Spreadsheets

GENERATING RANDOM NUMBERS

While working in *Lotus 1-2-3*, I occasionally need to generate random numbers that must be exact multiples of some particular value. For example, I may need a set of values ranging from 0 to 20 that fall on even boundaries of 0.5—such as 12.5, 2.5, 10.5, 0, 20, 16.5, 4, 8, 2.5, and 6. To obtain a single random number of this sort, I use the formula

```
@INT (@RAND* (UP-LOW+INT)
/INT)*INT+LOW
```

where UP, LOW, and INT represent the upper limit, the lower limit, and the boundary interval. To simplify the use of this formula, I wrote the macro listed in Figure 1. The macro prompts for UP, LOW, and INT, uses an (if) statement to make sure that the difference between UP and LOW is evenly divisible by INT, then generates the appropriate random-number formula.

J. Alfredo Perez
Miami, Florida

PC By itself, the RAND function included in all spreadsheet programs returns a floating-point number greater than 0 and less than 1. Writing a formula to produce a random number between some other lower and upper limit is not difficult, but if you do it only occasionally you may find yourself having to rework the problem in your head each time. Perhaps that's why Microsoft included a handy RAND-BETWEEN function in the latest *Excel* upgrade (it's one of several functions that can be attached to *Excel 3.0* via the ADDINFNS.XLA add-in). To get a random integer between 1 and 100 in *Excel*, you can simply write =RAND-BETWEEN(1,100).

Mr. Perez's macro brings the convenience of the RANDBETWEEN function to *Lotus 1-2-3* and *Quattro Pro* users. It also goes one step further, allowing you to force the random results to

■ **GENERATING RANDOM NUMBERS:** Two *Lotus 1-2-3* macros let you generate a formula that produces a random number between two limits, which you specify.

■ **COLORED PATTERNS FOR EXCEL CELLS:** Format Patterns gives you a way to turn your *Excel* worksheets into project and resource management tools, or to simply highlight special areas of the sheet.

■ **SYMPHONY COLORS:** A *Lotus 1-2-3* trick for changing screen colors works for *Lotus Symphony*, too.

you want your result to be any whole number between the designated end points, specify 1 in response to the third prompt. If you want a random number that falls on some other interval boundary (such as 0.5), supply that interval value as the third parameter.

The formula created by the macro will reference the actual numbers that you enter as parameters, not the range names employed by the macro. For example, if you specify 1, 11, and 2 as your lower limit, upper limit, and interval, you'll get the formula

```
@INT (@RAND* (11-1+2)/2)*2+1
```

(Obviously, you can simplify the terms within parentheses if you choose, but there's no particular reason to do so.) Because the formula uses hard-coded numbers rather than symbolic variables, you can generate it once and then copy it to get a sequence of random numbers meeting identical criteria. To change the criteria, just run the macro again.

If you store this macro in a library file managed by the *1-2-3 Macro Manager* add-in, you can run it unmodified from any Release 2.01, Release 2.2, or Release 2.3 worksheet. *Quattro Pro* users can also run the macro as is from any worksheet designated as a macro library.

fall along evenly spaced intervals.

If you store this macro in a *1-2-3* or *Quattro Pro* macro library, you can just press Alt-R and reply to the prompts whenever you need a random value. If

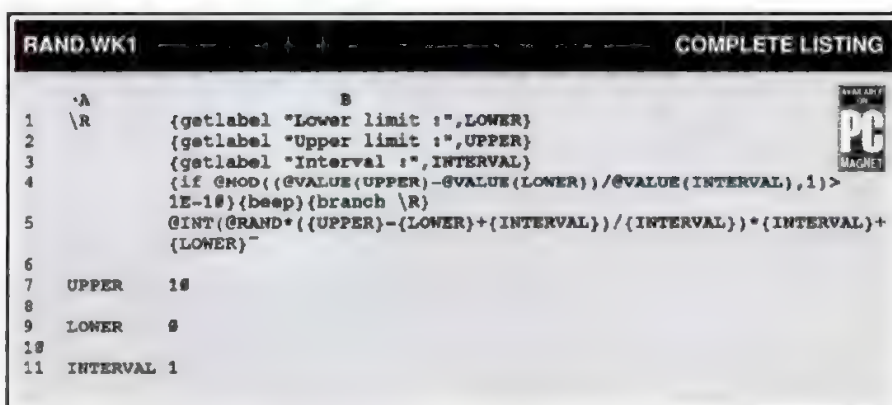


Figure 1: The interactive RAND macro lets you generate a formula that produces a random number that falls on a specified boundary.

Spreadsheets

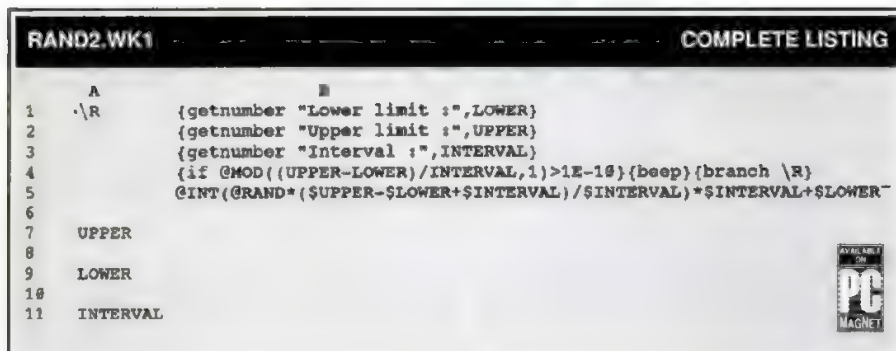


Figure 2: RAND2 functions just as the original RAND does. However, RAND2 uses named cells rather than constants for the UP, LOW, and INT parameters in the resulting formula. This method has advantages, but you can't invoke RAND2 from a library file.

If you use 1-2-3 Release 3.x, you'll need to modify the first three lines of the macro to read

```
{getlabel "Lower limit: ",
<<LIBRARY.WK3>>LOWER}
{getlabel "Upper limit: ",
<<LIBRARY.WK3>>UPPER}
{getlabel "Interval: ",
<<LIBRARY.WK3>>INTERVAL}
```

where LIBRARY.WK3 is the name of your macro-library worksheet.

There are two things worth pointing out about the construction of the macro. First, the {if} statement in B4, which verifies that UPPER-LOWER is evenly divisible by INTERVAL, does not test for exact equality. Rather, it allows for a minuscule (1E-10) deviance from equality, taking into account the possibility that two equivalent decimal expressions might be converted into nonequivalent binary values.

Second, the macro uses {getlabel}, rather than {getnumber} to obtain your random-number parameters. This choice has the awkward side effect of forcing the validity check in line 4 to incorporate three @VALUE functions. By using {getnumber} in lines 1 through 3, Perez could have simplified line 4 to

```
{if @MOD((UPPER-LOWER)/INTERVAL,
1)>1E-10}{beep}{branch \R}
```

But plugging text values into the cells named UPPER, LOWER, and INTERVAL allows the macro to treat those cells as subroutines and to build a random-number formula that references the cells by value, rather than by name. Why is this

important? Because it lets the macro be called from a *Macro Manager* library. The alternative version, which is listed in Figure 2, creates the following random-number formula:

```
@INT(@RAND*($UPPER-$LOWER+$INTERVAL)
/$INTERVAL)*$INTERVAL+$LOWER
```

This formula works fine as long as the range names LOWER, UPPER, and INTERVAL are defined on the current worksheet. When you truck the macro off to a *Macro Manager* library, though, the range-name definitions depart along with the code. The macro then builds an invalid formula.

COLORED PATTERNS FOR EXCEL CELLS

I have used *Microsoft Excel* 3.0's Patterns capability to create a simple but practical

resource-planning tool. The worksheet shown in Figure 3 allows me to track activities, projects, planned vacation times, illnesses, holidays, and you-name-it for a staff of 29 people.

I put employees' initials in the top row of the worksheet and dates in the first column. Then I reduce the width of the columns and heights of the rows to make each cell a small square. On a standard VGA screen, my system has room for about 40 columns (employees). And with each row representing one week, I can visualize almost half a year on a single screen or printout.

At the top of the screen, I have created a set of macro buttons, each of which paints the selected cells with a different pattern. The macros are all extremely simple. For example, the macro attached to the "vacanze" (vacation) button looks like this:

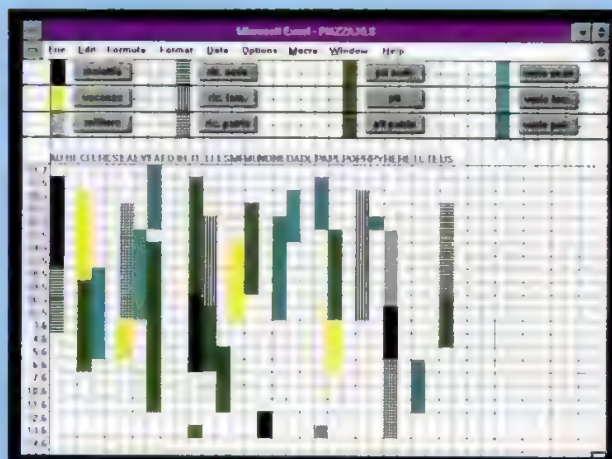
```
Vacanze (v)
=PATTERNS(1,6,0)
=RETURN()
```

The others are similar, except that they use different arguments for the Patterns function.

Next to each macro button, I've drawn a sample of the associated pattern, so the buttons serve as a legend for the chart as well as an input device. As I scan the chart, I can tell at a glance what each pattern stands for.

I have experimented with most of the patterns available in *Excel* and have found that the following give the best results on both a VGA color screen and an HP LaserJet printer: (1,6,0), (1,0,0),

Figure 3: With Format Patterns, you can use *Excel* as a simple resource- or project-planning tool as this screen shows (in Italian).



Spreadsheets

(1,15,0), (5,0,2), (6,0,2), (15,0,2), (7,0,4), (8,0,4), (9,0,4), (18,0,8) (17,0,8), (4,0,8). With these options, you can easily distinguish up to 12 different activities, and you can group related activities together by their background colors.

Roberto Piazza
Lugano, Switzerland

PC *Excel 3.0's Format Patterns command can be useful for project tracking, resource planning, or just highlighting areas of interest on an ordinary worksheet. The macro equivalent of this command has eight different syntax variants, depending on whether its recipient is a cell, a chart item, or an object. Fortunately, the syntax for changing the appearance of a worksheet cell is the simplest of the bunch. It requires three parameters—a pattern number, a foreground color number, and a background color number.*

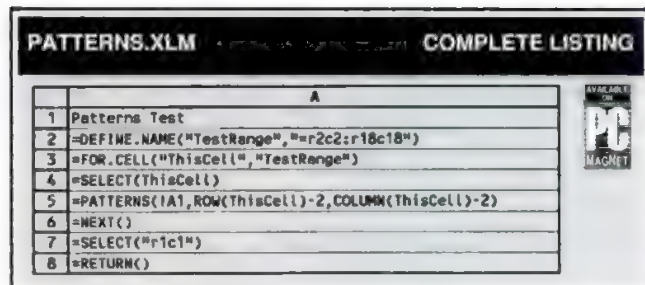


Figure 4: This simple macro displays each of *Excel's* cell patterns in all of the possible color combinations. You just type the number of the pattern you want to see in cell A1.

Each parameter corresponds to a setting in the Format Patterns dialog box. The pattern number can be anything from 1 to 18, while the color parameters can vary from 0 to 16. A setting of 0 for either color parameter designates the "automatic" color, which is normally black for foreground and white for background.

You'll want to consider the capabilities of your output device when using the Patterns command. For most printers, that means sticking with simple patterns and contrasting colors.

You can use a simple macro to test out all of *Excel's* pattern and color options. Enter a series of numbers from 0 to 16 in cells B1:R1 and another series from 0 to 16 in A2:A18. Use the Format Borders command to set heavy lines at the boundaries of each cell in this grid. Then enter the macro listed in Figure 4, and assign it the keyboard shortcut Ctrl-P.

In cell A1 of the worksheet, type a number between 1 and 16. Press Ctrl-P, and *Excel* will fill out the grid with your pattern number in each combination of foreground and background colors. The numbers in column A and row 1 represent the foreground and background colors, respectively. (If you cycle through all 16 pattern numbers with this macro, you will probably get an error message from *Excel* at some point indicating that you've assigned too many formats to the current worksheet. If

that happens, close and reopen your worksheet and try again.) You can add an ECHO(FALSE) statement at the top of the macro if you'd rather not see the grid being built. Figure 5 shows how the grid would look with pattern number 5.

SYMPHONY COLORS

Many thanks for the color information for *Lotus 1-2-3* ("Coloring Release 2.01," September 10, 1991). This is just a quick

Excel 3.0's Format Patterns command can be useful for tracking, planning, or just highlighting areas on an ordinary worksheet.

note to let you know that the information you gave also works on the .SET files in *Lotus Symphony*. Release 2.0 of *Symphony* comes with two .SET files (LOTUS.SET and UTIL.SET). In both of these files, the sequence 07 30 0A 3F occurs only once, and color changes made according to the table in the previously mentioned column work the same way for *Symphony*.

Jack E. Garrett
Morristown, New Hampshire

PC Thanks for the additional news! In the column Mr. Garrett mentions, I reported the findings of Mr. James Guerin of Paris, France. As with 1-2-3, don't forget to make a backup of the original .SET files before applying a hex editor to the task.

HINTS, TIPS, QUESTIONS

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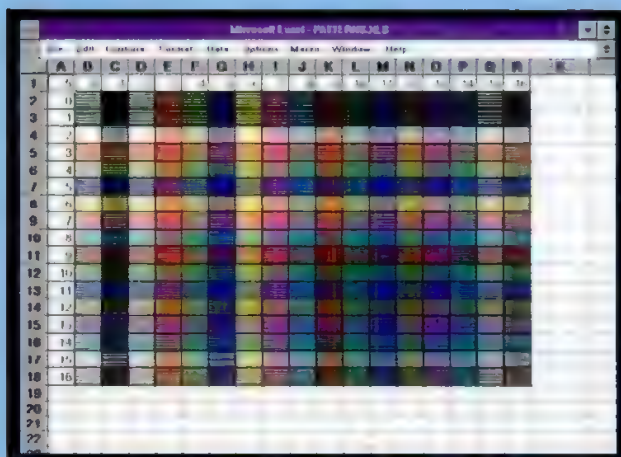
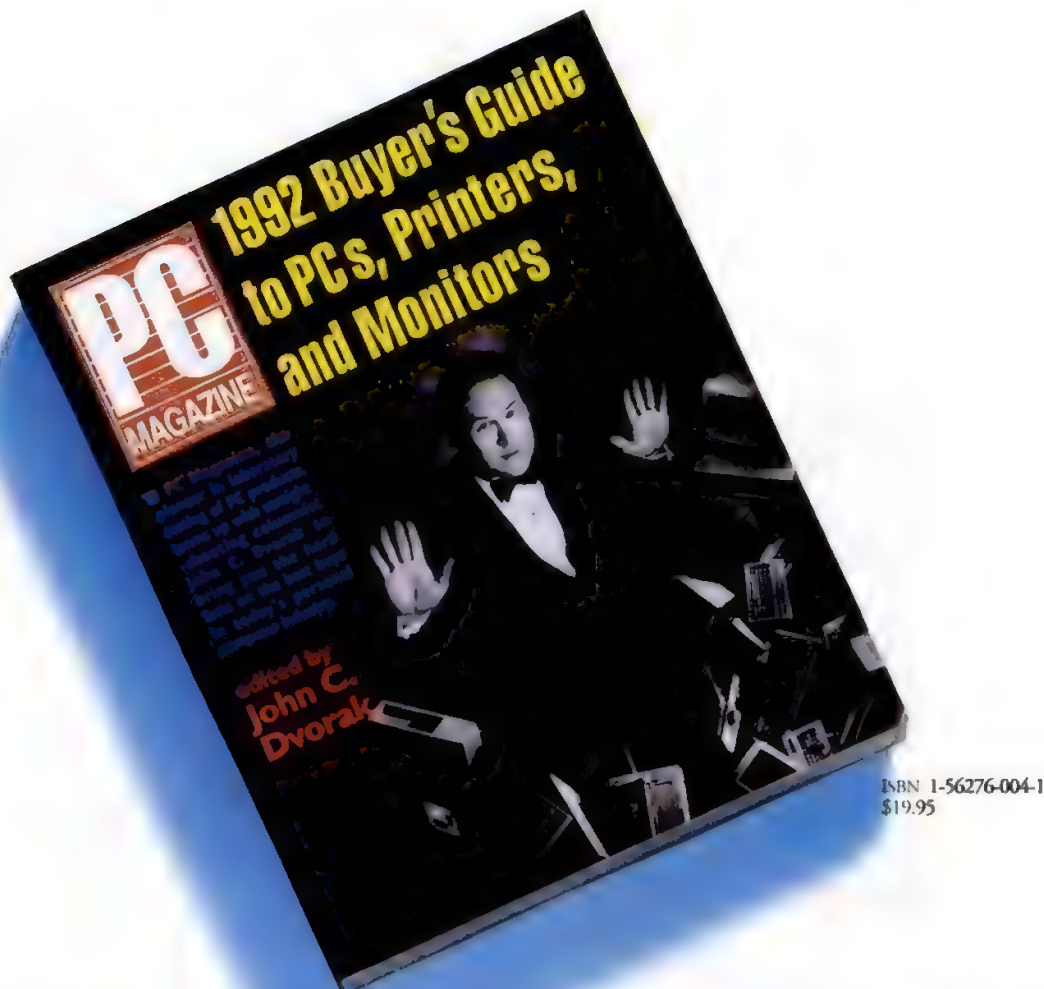


Figure 5: This screen appears when you type 5 in cell A1 and run the macro in Figure 4.

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CIRCLE 537 ON READER SERVICE CARD

by
Costa Rodis

The Working Word

LONG NAMES, SHORT NAMES

Several PC MagNet users have informed me that some *WordPerfect* macros presented in the Working Word aren't working for them. The reason for this is that the users have Long Document Names enabled and the macros use document-saving routines for short-named (standard) files. So I wrote a nice little macro called ALTF.WPM to take care of this problem.

Sally Neuman
Castle Rock, Washington



While most *WordPerfect* users probably do not take advantage of the Long Document Names option, those who do can run into problems when they attempt to use a document-saving macro that assumes short names are being used. Since all previous macros published in the Working Word have assumed that readers use short names, Ms. Neuman's solution of having a macro test *WordPerfect*'s Long Document Names status before attempting to save a document is a wonderful idea. This way, if you happen to change the Long Document Names option from time to time or if some computers in the office are set to long names and others are set to short names, including this routine in the macro means there's no need for two different versions of the same macro.

Ms. Neuman's original macro allowed a file to be saved automatically under its current name without pausing to check whether a document with the same name already existed elsewhere on the disk. Because I felt that this could be a potentially dangerous situation, I added code so you would have the option to give the current document a new filename. Although this can make the save process a little longer, the prompts I wrote are much easier to understand than *WordPerfect*'s native prompt messages, and you don't have to fear that you will overwrite an important file with something new.

You can build this macro (shown in

■ **LONG NAMES, SHORT NAMES:** If you use *WordPerfect*'s Long Document Names, this macro shows you how to run macros designed for standard short names.

Figure 1) yourself by first pressing Home, then Ctrl-F10 (Macro Define). When the Define Macro: prompt appears, hit Alt-F or whatever name you want for the macro. Next, the Description: prompt offers you the opportunity to record a few words about the macro (for example, "Save long or short docs quickly"). When you're done doing that, tap Enter.

You are now in the *WordPerfect* Macro Editor, which should be empty except for the code {DISPLAY OFF}. Delete this code. To create an initial-capitalized command (these stand for *WordPerfect* function keys) such as {Search}, just tap the F2 (Search) key. If the key or command is one the Macro Editor uses, press Ctrl-V before tapping the key for the code (for example, to get the {Enter} command, hit Ctrl-V, then Enter). Otherwise, you may be exiting or canceling the macro you are currently editing. The all-upper-case commands (those used only in macros, like {SYSTEM}) and the comment mark (;) are entered by choosing them from a list popped up by pressing Ctrl-PgUp. Although comments are optional, if you include them they must always end with a tilde (~).

The macro begins by invoking Save (F10). The remaining action of the macro occurs while *WordPerfect* is in the Save state. The

```
{IF}{SYSTEM}menu~125~
```

routine checks whether *WordPerfect*'s Setup menu is set for the optional Sum-

mary screen to be active. If it is, the macro calls the {Cancel} command in order to disable it. The following {IF} statement, beginning

```
{IF}{SYSTEM}menu~65027~
```

and finishing with {END IF}, moves the action of the macro to the {LABEL} LongSave if long document names are active. Otherwise, if short document names are active, the macro action jumps to the {LABEL} ShortSave.

ShortSave gives the current document name to a variable called filename

```
{{ASSIGN}filename~{SYSTEM}name~~}.
```

If the variable filename contains any text (in other words, if the document has already been named), the filename is entered, the file is replaced with a Y response to the "Replace?" prompt, and you're presented with a message that confirms the current text has been saved. Otherwise, should the variable filename be empty, the macro jumps to the {LABEL} ShortName.

The {TEXT} command at the beginning of the ShortName label prompts you to enter a filename. This is saved into the variable filename, which is then entered into *WordPerfect*'s Save prompt. If a Yes/No condition exists—which would mean a document with this name already exists—the macro goes on to the ShortExists label. Otherwise, the document has been saved and the macro quits.

The {LABEL} Exists sounds a tone ({BELL}) to warn you that the filename you've just typed already exists. The {CHAR} string that follows creates a message asking whether you want to overwrite the file. (The filename, like certain other words displayed by the macro, appears in boldface type. This is accomplished by entering Ctrl-] before and Ctrl-\ after the text you want highlighted; it's important to remember to press Ctrl-V before entering each of these.


```
{;}This macro will initiate the file save routine in a WordPerfect
5.1 document.

If the system is set up for filling in document summaries, it will
cancel the summary option. Then, it moves on to check the status
of the system variable "Menu", to see if long document pathnames
are enabled. If yes, the macro will jump to the LongSave routine
and prompt the user for the long filename, type, and name. If no,
it will prompt the user for the filename for saving.

{Save}                                {;}Start Save routine"
{IF}{SYSTEM}menu="125"                {;}If Summary Screen is active...
  (Cancel)                            {;}...skip Summary"
{END IF}                              {;}End IF statement"

{IF}{SYSTEM}menu="65927"              {;}If long doc names are active...
  {GO}LongSave"                      {;}...go to long filenames routine"
{ELSE}                                {;}Otherwise..."
  {GO}ShortSave"                     {;}...go to short filenames routine"
{END IF}                              {;}End IF statements"

{LABEL}ShortSave"                    {;}Short filenames routine"
{ASSIGN}filename="(SYSTEM)name""      {;}Give current document name
to variable called "filename"."

{IF EXISTS}filename"                 {;}
  (Enter)y                            {;}Message placed on screen"
  {PROMPT}{"}File-{R}{VARIABLE}filename{"Q}-was-replaced!" {;}
  {WAIT}15"                           {;}Message held on screen a bit"
  {DISPLAY OFF}                       {;}Return control to the screen"
  {QUIT}                              {;}Get out of macro"
{ELSE}                                {;}Otherwise..."
  {GO}ShortName"                     {;}Go to "ShortName" label"
{END IF}                              {;}End IF statement"

{LABEL}ShortName"
{TEXT}filename{""}Enter{""}NAME{""}of file to be saved:--"
{VARIABLE}filename="(Enter)"          {;}Prompt for name of file being saved"
{IF}{STATE}1824"                      {;}Enter file name into save"
  {GO}Exists"                         {;}If a yes/no condition exists..."
{ELSE}                                {;}...go to "Exists" label"
  {QUIT}                              {;}Otherwise..."
{END IF}                              {;}Quit the macro"
{;}End IF statement"

{LABEL}Exists"
{BELL}                                {;}Warning tone sounds"
{CHAR}9{""}File-{R}{VARIABLE}filename{""}already exists:..
  Overwrite?..(Y/N)..                {;}Place message on screen and save
user response (Y or N) into Var.9"

{CASE}{VAR 9}"Y Replace"Y Replace"N NewName"N NewName"
{ELSE}Exists"
```

Figure 1: This *WordPerfect* file-saving macro checks to see whether you have the Long Document Names feature enabled or not, and correctly handles either possibility. It also prompts you for a new name if the filename you type already exists.

Sometimes, too, I have used the ^R and ^Q codes, which give you reverse highlighting.) The {CASE} statement that follows places the response to the message into variable 0, and then uses variable 0 to determine what action the macro should take next. If Y or y exists in the variable, the macro jumps to {LABEL} Replace, which saves the current document with the name you've chosen. If an N or n exists in the variable, the macro moves on to {LABEL} NewName. Any response other than a Yes or No loops the macro back to the beginning of the Exists label to repeat the overwrite warning.

Should the macro jump to the {LABEL} NewName, the document is not replaced and the macro moves back to the {LABEL} ShortName. Otherwise, if the macro jumps to the Replace label, a Y is entered for replacing the current file and a message is flashed on-screen to confirm that fact.

The {LABEL} LongSave works just like the ShortSave label, with the exception that if the filename already exists, three Enters confirm the long name, document type, and DOS filename before confirming replacement with a Y. Otherwise the macro continues on to {LABEL} LongName. LongName prompts you for a new long name, a file type, and a filename, and then quits, unless the filename already exists, in which case we are sent to the label Exists. A Y response to the warning that the filename already exists results in the macro jumping to {LABEL} Replace while an N moves the macro on to the LongName label.

You should take note that {LABEL} NewName, which responds negatively to the "Replace?" prompt, pops you over to the ShortName label rather than to the LongName label. The reason for this seeming inconsistency is that even when *WordPerfect* is operating in Long Docu-

ment Names mode, a No response to the "Replace?" prompt takes you to the "Document to be saved:" prompt, which calls for a DOS filename to be entered. For this reason, it is possible to use the same Replace label for both short and long saves when it comes to replacing an existing file.

TIPS FROM WORKING WORDSMITHS

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by
Neil J. Rubenking

User-to-User

RETURN TO THE CURRENT DIRECTORY

There are many situations in which you're using large, complex batch files for editing, compiling, making backups and so forth. When the batch file finishes its job, you're left in some directory and you have to remember where you were and navigate your way back. GETHOME.COM was written for such situations.

This little utility, redirected to GOHOME.BAT, brings you right back to where you started. Here's an example of how you might use it:

```
@echo off
GETHOME > F:\GOHOME.BAT
REM * move to other drive and
    directory and do something
F:\GOHOME
```

- **RETURN TO THE CURRENT DIRECTORY:** Here's a quick way to return to your starting drive and directory.
- **LIMITING HARD DISK ACCESS:** A clever trick lets you hide portions of your hard disk from view.

I've used a RAM disk here but any drive (hard disk or floppy) will do.

Kalevi Hautaniemi
Finland



Over the years we've published any number of solutions to the problem of returning to the directory that was current when your batch file started. They've ranged from simple ones that appended the output of the CD command to a file containing just the characters "CD" to arcane ones that got both drive and directory information from the DOS prompt. There's no denying, though, that this simple program is *faster* than any of the DOS-command-based solutions that we've seen in the past.

You can compile the .ASM file which is shown in Figure 1 to get the program, but you'll probably find that it's much easier just to use DEBUG with the script shown in Figure 2. Assuming the script is in a file called GETHOME.SCR, the command:

GETHOME.ASM	COMPLETE LISTING
<pre>===== ; ; GETHOME.ASM ; ;To make GETHOME.COM you have to compile this file to .OBJ file. ;Following syntax is for Turbo Assembler (Borland): ; ; TASM gethome ; ; Then it must be linked to .COM file. ; Syntax is: ; ; TLINK /t gethome ; ===== WRITE_STDOUT MACRO MOV BX,01h ; COM file handle. MOV AX,40h ; Write thru handle. INT 21h ENDM _TEXT SEGMENT PUBLIC 'CODE' ASSUME CS:_TEXT, DS:_TEXT, ES:_TEXT, SS:_TEXT ORG 100h START: JMP SHORT MAIN DRIVE DB "A:" CHLP DB 13,10 CMD DB "CD \" BUFFER DB 64 DUP (?) MAIN: MOV AX,19h ; Get default drive. INT 21h ADD DRIVE,AL ; Now, print character and colon. MOV DX,OFFSET DRIVE</pre>	<pre> MOV CX,4 ; Four chars, including CR/LF. WRITE_STDOUT ; Get current directory XOR DL,DL ; Current drive into DL MOV SI,OFFSET BUFFER MOV AH,47h ; Get directory INT 21h ; Count path string length into CX. CLD XOR CX,CX ; Forward search. ; Zero length counter. COUNT_LOOP: LODSB ; Get a byte. INC CX ; Bump counter. OR AL,AL ; Is byte, just read, zero? JNS COUNT_LOOP ; If not, get next byte. ; Print it: ; ADD CX,4 ; Include "CD \" along MOV DX,OFFSET CMD WRITE_STDOUT ; Print CR/LF pair also. MOV CX,2 MOV DX,OFFSET CHLP WRITE_STDOUT ; That's all. ; MOV AX,4C00h INT 21h _TEXT ENDS END START</pre>

Figure 1: You can either assemble this .ASM file (see the instructions at the top of the listing) or use the DEBUG script in Figure 2 to create GETHOME.COM, a utility that saves your current drive and directory information so you can easily return.

User-to-User

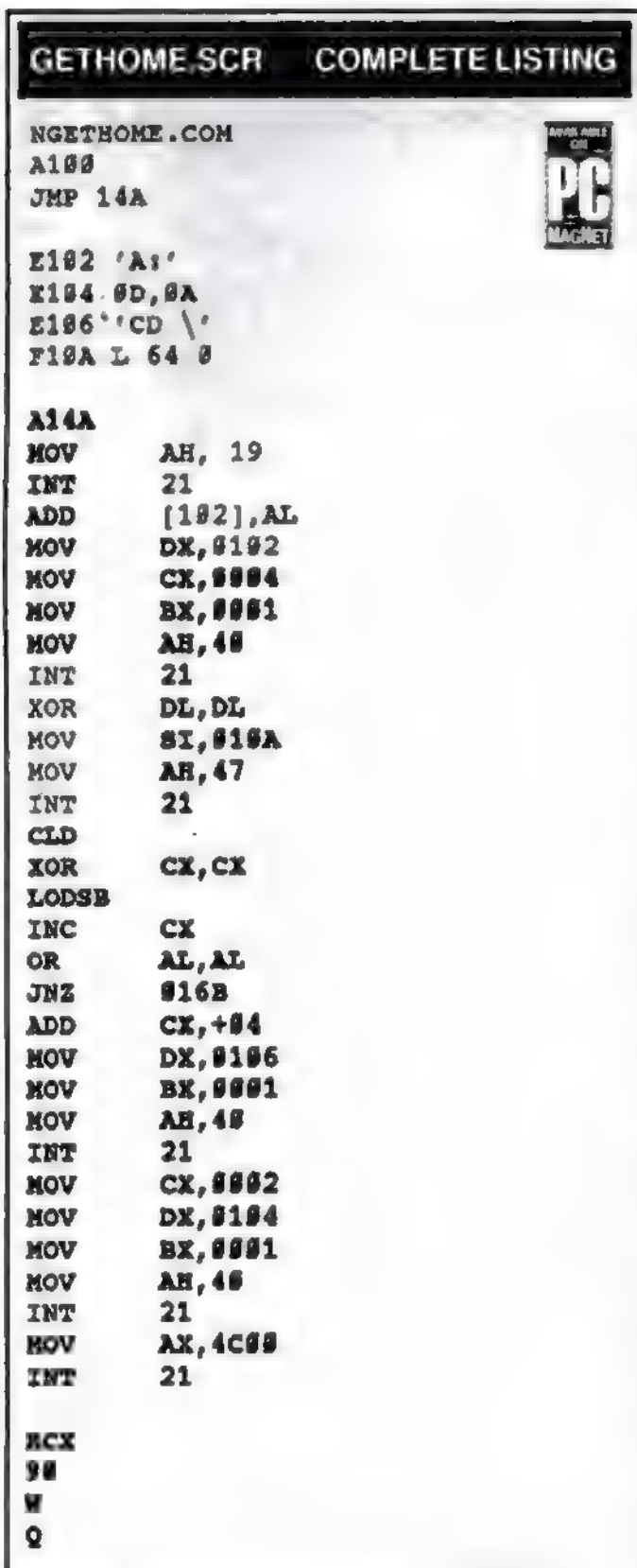


Figure 2: Redirect this script into DEBUG to create GETHOME.COM, a utility to return to the directory that was current when your batch file started.

```
DEBUG < GETHOME.SCR
```

will create the GETHOME.COM program. Note the three blank lines embedded in the text; one just after JMP 14A, one just before the line A14A, and one before RCX. You must include these three blank lines, plus the one after the final Q.

Give it a try: Type GETHOME at the command line. You'll see one line containing the current drive and another containing a command to change to the current directory. Redirect both of these lines to a temporary batch file at the beginning of your batch program, then call on that temporary batch file to get back to the place that you started from.

LIMITING HARD DISK ACCESS

From time to time I need to let remote users connect to my computer via a modem, so, for obvious reasons, I wanted to find a simple method to limit these users to only selected portions of my disk. The DOS command SUBST, which allows you to assign a logical drive to a particular path, immediately came to mind. So I tried the command

```
SUBST C: C:\PUBLIC
```

and received the error message "Invalid parameter." But then I thought that maybe DOS could be tricked by using indirection, a common technique in the computer science world. I realized that in order for this technique to work, I'd have to use another DOS command, ASSIGN, which allows a drive designator to be reassigned to a different drive. I tried using the two commands together

```
SUBST D: C:\PUBLIC
ASSIGN C=D
```

and to my delight, it worked. A directory listing of C:\ confirmed that C: had in fact been reassigned to the subdirectory PUBLIC.

This technique allows you to "hide" part of your disk, so that the drive's "root directory" is actually a subdirectory of the hard disk. Of course, you could assign drive C: to a floppy disk if you wanted to, but then you'd be limited to 1.2MB or 1.44MB at most, whereas the method that I've presented here creates a logical drive that is limited only to the total disk space on your hard disk.

I wanted to take this method a step further: Could I make more than one subdirectory accessible to remote users? The answer is yes:

```
SUBST F: C:\LIBRARY3
SUBST E: C:\LIBRARY2
SUBST D: C:\LIBRARY1
ASSIGN C=D
```

I found that drives D:, E:, and F: were still pointing to subdirectories (of the original C:\) LIBRARY1, LIBRARY2, and LIBRARY3, respectively, even though the definition of C had changed upon execution of the ASSIGN statement. Apparently, the SUBST command assigns to each logical drive the address of the directory table to use as that drive's root directory, so that any subsequent change in the

definition of C: does not affect the logical drive definition. You could even be more restrictive and assign drive designators to subdirectories further down in the directory tree.

A couple of warnings should be mentioned before you use this technique. First, you should have a DOS floppy handy or a copy of ASSIGN.COM in one of the subdirectories that is still accessible after the reassignment of C:. Even though you may have C:\DOS in your path, C:\DOS no longer exists after reassignment, since your root directory of C: is now different. If you don't, you'll have to reboot the computer to reestablish the correct definition of C:. (You could, of course, establish a subdirectory C:\PUBLIC\DOS that would become C:\DOS when you reassigned C:, but that might be too costly in terms of disk space.)

Also, depending on how users access your system, a user could run your auxiliary copy of ASSIGN.COM remotely, causing your drive specifier to revert to its original value. What I've done to remedy this problem is rename ASSIGN.COM to something ridiculous (like WILDCATS.COM), and set the file's hidden attribute so that it doesn't show up in standard directory listings. Thus I can reestablish the correct value for C: (simply by typing WILDCATS), while preventing remote users from doing the same. It's also a good idea to provide safeguards so that a remote user can't copy his own version of ASSIGN.COM to your machine and then run it.

I first discovered the power of combining SUBST and ASSIGN with MS-DOS, Version 3.20. Further testing confirmed that it also works with Versions 3.31 and 4.01. It seems likely that this method will work with any DOS version that includes the SUBST command.

Ian Duplisse
Aurora, Colorado



The SUBST command was introduced with DOS 3.1, and this clever trick works with versions all the way up to DOS 5.0. SUBST information is stored in the current directory structure (CDS), an undocumented DOS data area that keeps track of the current directory on every available drive. By default, the current directory structure has enough entries for every drive on your system, but you can expand it to allow SUBST drives by using a LAST-DRIVE= line in your CONFIG.SYS.

User-to-User

Besides the full pathname of the current directory, each CDS entry indicates whether the drive is SUBSTed or JOINed. Suppose you've used SUBST to set drive F: to the directory C:\PROG, and the current directory on F: is F:\DOS. The sixth entry in the CDS will contain C:\PROG\DOS. A data field in the entry tells DOS where the SUBSTed portion ends; in this case it would contain the offset within the path string of the backslash just before "DOS".

Do heed the warning to keep ASSIGN.COM available, because without it you

SUBST information is stored in the Current Directory Structure, an undocumented DOS data area that keeps track of the current directory on every available drive.

won't be able to return your C: drive to normal without rebooting. And remember that the reassignment of C: may invalidate some of the directories on your PATH. You'll probably want to create a batch file that both "hides" the C: drive and creates an appropriate new PATH.

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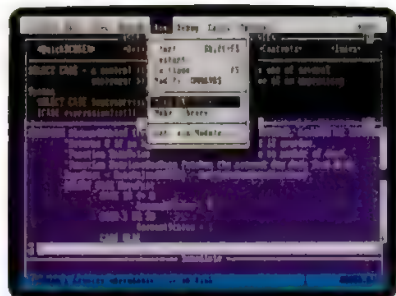
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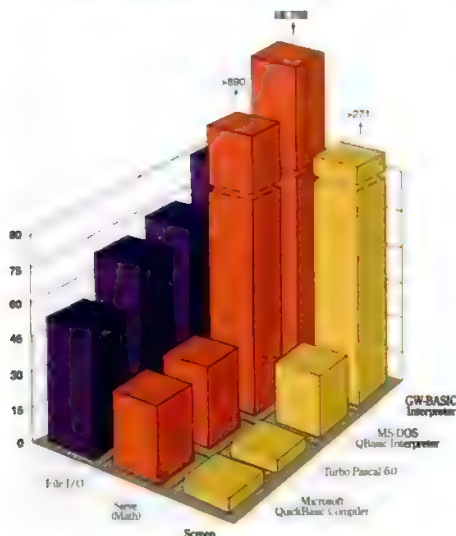
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PROGRAMMER'S TIPS

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- Multiple Modules
- Run/Edit/Continue w/o recompiling
- PROCEDURES & FUNCTIONS w/ local variables & parameter passing
- User Definable data types/structures
- SELECT CASE & DO/WHILE
- Line Numbers & GOTO/GOSUB
- Watch Variables

Microsoft QuickBasic[™] Compiler

Yes
640K
Yes
Yes
Yes
Yes
Yes
Allowed
Yes

MS-DOS QBasic[™] Interpreter

No
160K
No
Yes
Yes
Yes
Yes
Allowed
No

GW-BASIC[™] Interpreter

No
64K
No
No
No
No
No
Required
No

Turbo Pascal[™] 6.0

Yes
640K
Yes
No
Yes
Yes
Yes
Allowed
Yes

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Microsoft

edited by
Trudy Neuhaus

Languages

VALIDATING DATES IN QUICKBASIC

One recurring problem facing programmers who write data entry software is how to validate a date that was entered by the user. Although it is easy to ensure that a month is within the range 1 through 12, checking the day is much harder because you must take leap years into consideration. A year whose number is evenly divisible by 4 is a leap year with the exception of centennial years (evenly divisible by 100), which are leap years only when they are evenly divisible by 400.

QuickBASIC doesn't provide any built-in date checking functions so I wrote the assembly language routine shown in Figure 1 to return the number of days in a given month. Because it uses simplified segmentation, you will need MASM 5.1 or later for assembling. Then you can add

■ **VALIDATING DATES
IN QUICKBASIC:** Here's
an assembly language
function to check
dates in QB.

■ **PASSING DATA
BETWEEN PROGRAMS
VIA IACA:** The IACA is
handy for passing data.
Here's an easy way to
access it in C.

the DaysInMonth function to a library, or link it directly to a QuickBASIC program. You would declare and use this function as follows:

```
DECLARE FUNCTION DaysInMonth%  
(Month%, Year%)  
IF Day% < 1 OR Day% >  
DaysInMonth%(Month%, Year%) THEN  
    'there is an error in the validity  
    of the date  
END IF
```

Because checking the validity of a month or year is pretty straightforward, I did not include them in the program, but they could be easily added.

L.K. Fergerson
Chapel Hill, North Carolina



Assembly language functions are one of the truly great features Microsoft introduced in QuickBASIC, Version 4.0. Earlier versions could call assembly language routines, but those routines could not be designed

DAYSINMONTH PROCEDURE

COMPLETE LISTING

```
.model medium, basic  
.code  
  
; This procedure determines the number of days in a given month  
; Receives: Arg1 month in question  
;           Arg2 year  
; Returns: AX number of days in month  
; Formula used to determine number of days in month:  
; if month > 7 and evenly divisible by 2 then days = 31  
; if month <= 7 and not evenly divisible by 2 then days = 31  
; if month > 7 and not evenly divisible by 2 then days = 30  
; if month < 7 and evenly divisible by 2 then days = 30  
  
DaysInMonth Proc Arg1:Word, Arg2:Word  
  
    mov bx, arg1          ;month  
    mov ax, [bx]          ; in AX,  
    mov bx, arg2          ;year  
    mov cx, [bx]          ; in CX  
    cmp ax, 2             ;Is the month Feb?  
    js feb                ;Yes, go test for leap year  
    push ax  
    shr ax, 1             ;No, divide AX by 2  
    jc not_div_by_2  
  
div_by_2:  
    pop ax                ;Get original month  
    sub ax, 7             ;Compare month to 7  
    js days_equal_30      ;Month is < 7  
  
days_equal_31:  
    mov ax, 31  
    jmp done  
  
days_equal_30:  
    mov ax, 30  
    jmp done  
  
not_div_by_2:  
    pop ax                ;Get original month
```

```
    cmp ax, 7             ;Compare month to 7  
    jbe days_equal_31  
    jmp days_equal_30  
  
feb:  
    mov ax, cx            ;Year in AX  
    push ax               ;Save year for future tests  
    mov bx, 100           ;First test, is year evenly  
    div bx                ;divisible by 100  
    or dx, dx  
    js check400           ;Yes, check divisibility by 400  
  
    pop ax                ;No, get year again in AX  
    mov bx, ax            ;Put year in BX for comparison  
    mov cx, 4             ;Divide year by 4  
    shr ax, cx            ;then multiply by 4  
    cmp ax, bx            ;Did we get original year back?  
    js isleapyear         ;Yes, we have a leap year  
    jmp notleapyear      ;No  
  
check400:  
    pop ax                ;Get year back in AX  
    mov bx, 400           ;Divide it by 400  
    div bx                ;Did it divide evenly  
    or dx, dx             ;Yes, we have a leap year  
    js isleapyear  
  
notleapyear:  
    mov ax, 28            ;28 = no leap year  
    jmp done  
  
isleapyear:  
    mov ax, 29            ;29 = leap year  
  
done:  
    ret  
  
DaysInMonth Endp  
End
```

Figure 1: This assembly language function can be added to any program created with Microsoft QuickBASIC, Version 4.0 or later, to report the number of days in a given month.

Languages

as a function that returned a value directly. Using previous versions of QuickBASIC, the main program would have to call a routine passing an extra parameter, and then examine that parameter with a separate test. With functions, however, a program can simply compare the function result, use it in an assignment, or even print it directly. Further, by eliminating a passed parameter, the compiled code that QuickBASIC generates will be smaller, and the assembler routine itself is also simpler.

Unlike called subprograms, it is mandatory that all functions be explicitly declared—especially those written in assembly language. Otherwise, QuickBASIC would have no way to know that `DaysInMonth%` is not simply an integer variable.—*Ethan Winer*

PASSING DATA BETWEEN PROGRAMS VIA IACA

The Intra-Application Communication Area (IACA) is a 16-byte area of low memory (0040:00F0h to 0040:00FFh) that DOS sets aside to let one program communicate with another. While this is not a lot of space to pass data between programs, you can use the IACA to store up to four far (4-byte) pointers.

To demonstrate, I wrote a program, `IACAMAIN.C` (Figure 2), which allocates a far memory buffer, puts the address of the buffer into the IACA, and starts another program, `IACACHLD.C` (Figure 3). The latter retrieves the address of the memory buffer from the IACA, writes a message to it, and returns. `IACAMAIN` retrieves the message from the buffer. I've also included the Make file for these two programs (Figure 4).

Sharon Casper
West Hartford, Connecticut



The IACA is a DOS facility that's not often talked about, but it has been used by applications with multiple modules and overlays. However, since the IACA can be used by *any* program and there are absolutely no rules governing its use, it's a good idea to take a number of protective measures when you use it.

First, minimize the time that any data is left in the IACA. If a child program gets information from its parent via a pointer

```
IACAMAIN.C                                     COMPLETE LISTING

/* IACAMAIN.C
   Demonstrate the use of the Intra-Application Communication Area (IACA)
*/

#include<process.h>
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
#include<malloc.h>
#include"iaca.h"

void main(void);

#define BUFFER_SIZE    256

void main(void)
{
    char *message_buffer;

    if((message_buffer = malloc(BUFFER_SIZE)) == NULL)
    {
        puts("\nError: Unable to allocate memory.");
        exit(-1);
    }

    // Store return buffer address in first 4 bytes of the IACA
    _Iaca[0] = (void far *)message_buffer;
    printf("IacaMain: message buffer set to %p...running child...\n",
        (void far *)message_buffer);

    if(spawnl(P_WAIT, "IACACHLD.EXE", NULL) == -1)
    {
        puts("\nError: Unable to locate IACACHLD.EXE.");
        exit(-1);
    }

    printf("IacaMain: message from child is '%s'\n", message_buffer);
    free(message_buffer);
}
```

Figure 2: This program demonstrates how you can use the IACA to store up to four far (4-byte) pointers.

```
IACACHLD.C                                     COMPLETE LISTING

/* IACACHLD.C - IACAMAIN's child program */

#include<string.h>
#include<stdio.h>
#include"iaca.h"

void main(void);

void main(void)
{
    char far *ptr;

    ptr = _Iaca[0];
    printf("Iacachld: ptr is set to %p...placing message there.\n", ptr);
    _fstrcpy(ptr, "Hello from IACACHLD");
}
```

Figure 3: After allocating a far memory buffer and putting its address in the IACA, `IACAMAIN` (Figure 2) starts this program.

stored in the IACA, it should *immediately* copy that pointer to its own local storage. In addition, if you use the IACA extensively, you should consider using a checksum or a signature to insure that the data stored in the IACA is valid—and that it's your own.

You can best use the IACA when you create parent-child applications: where

one program runs or spawns another one. However, if you'd rather avoid using the IACA, you can use I/O redirection or command line arguments to pass information to the child program. Or you can convert a pointer address to a string that's passed as a command line argument to the child program. Of course, the shared data area still belongs to the parent. But since



Languages

```

IACA.MAK — COMPLETE LISTING

# Make file for IACAMAIN and IACACHLD

all: iacamain.exe iacachld.exe

iacamain.exe: iacamain.c
#   cl /W3 iacamain.c
#   bcc iacamain.c

iacachld.exe: iacachld.c
#   cl /W3 iacachld.c
#   bcc iacachld.c
    
```



Figure 4: This is the Make file for IACAMAIN and IACACHLD.

```

IACA.H — COMPLETE LISTING

// iaca.h

#if !defined(IACA_H)

typedef void far *(far *IACAPTR);
#define IACAADDRESS 0x000004f0

void far *_IacaBase = (void far *)IACAADDRESS;
IACAPTR _Iaca = (IACAPTR)IACAADDRESS;

#define _IacaReset()    (_Iaca = (IACAPTR)IACAADDRESS)

#define IACA_H
#endif
    
```



Figure 5: This demonstrates that the objects being pointed to can be near or far as long as you use the full far address.

you pass the address on the command line, there's no risk that some other process will change it while making use of the IACA.

In any case, the IACA does make it easy to pass data between two or more programs, and each program can offer the other a far pointer to any part of its data. Consequently, one program can use the pointer address (which is placed in the IACA by another) to access data in the other program.

While Ms. Casper's example was written to use the Compact memory model (which uses far pointers to data), you needn't do so: The objects being pointed to can be near or far as long as you use the full far address.

To facilitate use of the IACA, I created the header file, IACA.H, shown in Figure 5. It contains a new data type, IACAPTR, which is a far pointer to a far pointer, and a global variable, _IacaBase, which is initialized to point to 0040:00F0h, which is the beginning of the IACA. A global IACAPTR, _Iaca, is initialized to _IacaBase and can be reset

to it via the _Iaca-Reset macro.

This makes it easy to access the IACA. For example

```
_Iaca[0] = (void *)buffer;
```

stores the address of the buffer in the first IACA pointer slot (which is actually the first 4 bytes). If the buffer is not a far object, or the memory model you're using doesn't use far data, you'll need to use the following line

```
_Iaca[0] = (void far *)buffer;
```

instead.

In order to compile IACAMAIN.C

and IACACHLD.C use

```
CL /W3 iacamain.c
CL /W3 iacachld.c
```

and

```
BCC iacamain.c
BCC iacachld.c
```

for Microsoft C, Versions 5.1 and 6.0a, and Borland C++, Version 2.0, respectively.—*Richard Hale Shaw*

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Tutor

PICK A CONFIGURATION AT START-UP

I'm trying to construct a batch file that lets me choose from among three boot configurations. To accomplish this, I need a program that reboots my PC by simulating a press of Ctrl-Alt-Del. Is it possible to create such a program with DEBUG, and if so, how?

Richard Cardran
Los Angeles, California



It sure is possible. You can perform a warm reset on your PC with REBOOT.COM. To create the program, start DEBUG and type this short script:

```
A 0100
MOV AX,40
MOV DS,AX
MOV WORD PTR [72],1234
JMP FFFF:0000

N REBOOT.COM
RCX
10
W
Q
```

The first statement—A 0100—tells DEBUG that you want to start assembling 80x86 instruction mnemonics. The lines

```
MOV AX,40
MOV DS,AX
```

load the value 40h into segment register DS.

The next instruction

```
MOV WORD PTR [72],1234
```

moves the value 1234h into the word at 0040:0072. When your PC is started, it checks the value at this location, and if the value is set to 1234h, it performs a warm boot (bypassing the memory check and other elements of the Power-On Self Test

- **PICK A CONFIGURATION AT START-UP:** REBOOT.BAT, a batch file that soft-boots your machine, is the key to choosing among several configurations at start-up.
- **FASTER RAM ACCESSES:** Factors that determine the speed of RAM accesses in your PC and techniques that accelerate these accesses.

(POST)—the same thing that happens when you press Ctrl-Alt-Del); otherwise, it performs a cold boot, which has the effect of turning the power switch off and back on.

The final instruction

```
JMP FFFF:0000
```

performs a far jump to the instruction at address FFFF:0000. This is the address at which Intel CPUs begin executing code when they're first powered up. On the IBM PC, this location, which is in the ROM BIOS, contains a JMP instruction that vectors execution to the start of the POST elsewhere in ROM.

With REBOOT.COM in hand, it's easy to create a batch file that lets you choose between two or more start-up configurations. For example, let's suppose you want to create a batch file that boots DOS when you type BOOT DOS and boots *Windows* when you type BOOT WINDOWS. Assume further that you have separate CONFIG.SYS and AUTOEXEC.BAT files for each of the two configurations and that the files are stored in the root directory of drive C:.

To start the procedure, you should initially name the files that correspond to DOS CONFIG.SYS and AUTOEXEC.BAT; name the ones that correspond to *Windows* CONFIG.WIN and AUTOEXEC.WIN. Then use the MS-DOS Editor (or any text editor) to create the BOOT.BAT file shown in Figure 1.

Now, when you want to boot *Windows*, type

```
BOOT WINDOWS
```

Similarly, when you want to boot DOS, type the line

```
BOOT DOS
```

Incidentally, the first four commands following @ECHO OFF in the batch file test for the command line parameter DOS or WINDOWS without regard to case. Thus, even though string comparisons performed with the IF command are case-sensitive, BOOT.BAT will work whether you type BOOT DOS, BOOT Dos, or even BOOT DoS. The secret? BOOT.BAT creates an environment variable that has the same name as the parameter you entered on the command line; it sets the environment variable to "\$\$" with the command SET %1=\$\$. Then with the lines

```
IF "%DOS%"=="$" GOTO DOS
IF "%WINDOWS%"=="$" GOTO
WINDOWS
```

the batch file tests for the existence of a variable named DOS or WINDOWS.

When you create an environment variable, DOS converts all the characters in the variable name to uppercase. Therefore, if you type BOOT Dos on the command line, the SET command reduces to SET DOS=\$\$, and the IF "%DOS%" command will return true. Likewise, if you type BOOT Windows, the IF "%WINDOWS%" command will return true and execution will branch to the

BOOT.BAT COMPLETE LISTING

```
@ECHO OFF
IF "%1"=="" GOTO ERROR
SET %1=$$
IF "%DOS%"=="$$" GOTO DOS
IF "%WINDOWS%"=="$$" GOTO WINDOWS

:ERROR
ECHO Syntax: BOOT DOS or WINDOWS
GOTO END

:DOS
IF EXIST \CONFIG.DOS GOTO BOOTDOS
ECHO DOS is already selected
GOTO END

:BOOTDOS
REN C:\CONFIG.SYS CONFIG.WIN
REN C:\CONFIG.DOS CONFIG.SYS
REN C:\AUTOEXEC.BAT AUTOEXEC.WIN
REN C:\AUTOEXEC.DOS AUTOEXEC.BAT
REBOOT

:WINDOWS
IF EXIST \CONFIG.WIN GOTO BOOTWINDOWS
ECHO Windows is already selected
GOTO END

:BOOTWINDOWS
REN C:\CONFIG.SYS CONFIG.DOS
REN C:\CONFIG.WIN CONFIG.SYS
REN C:\AUTOEXEC.BAT AUTOEXEC.DOS
REN C:\AUTOEXEC.WIN AUTOEXEC.BAT
REBOOT

:END
SET %1=
```

Figure 1: This batch file works together with REBOOT.COM to let you boot with a choice between two configuration setups: one tailored to *Windows* and the other to *DOS*.

line labeled **WINDOWS**.

If you typed neither parameter, execution will fall through to the line that displays an error message. The first statement in the batch file—`IF "%1"=="" GOTO ERROR`—is there so that the batch file won't crash if you don't enter any command line parameters. Without this line, the statement `SET %1=$$` would reduce to `SET =$$` (in the absence of a parameter to stand in for %1), and the error would consequently terminate the batch file.

You can use this technique in any batch file when you want to evaluate command line parameters without regard to case. Normally, it's prudent to delete the environment variables you created with the command

```
SET %1=
```

However, with **BOOT.BAT**, this isn't necessary. The reason for this is that the system is rebooted as soon as the batch file comes to an end.

FASTER RAM ACCESSES

I own a 20-MHz 386 with 4MB of RAM. The unit does not contain a RAM cache to speed memory accesses, but the manual notes that if you install an additional 4MB of RAM, to bring the total to 8MB, then you can opt for interleaved memory. What is interleaved memory, and how much of a speed increase can I expect if I fork over the money for another 4MB?

David Whitney
Oklahoma City, Oklahoma



Frankly, I'm surprised that you have to add another 4MB of RAM to effect memory interleaving. Interleaved memory can be implemented in virtually any system, even if there's only 640K (or less) of RAM installed. Evidently, the manufacturer of your PC chose to make it an option only if there's at least 8MB present.

Interleaved memory is one of several RAM architectures that PC manufacturers use to decrease the amount of time that the CPU must wait for data to be delivered from the memory subsystem once the data is requested. There are two factors that determine how quickly a dynamic RAM chip can divulge information. One is the chip's *access time*—the amount of time it takes a fully charged RAM cell (a set of transistors grouped together to form a logical data storage unit) to deliver one unit of data (typically 4 bytes, or 32 bits, on a 386). The other is *precharge time*—the amount of time it takes after an access for the cell to be reenergized so that it can be accessed again.

The sum of the access time and the precharge time is called the *cycle time*. In most chips, the cycle time is equal to slightly less than twice the access time. In a simple straight-through memory architecture, it is the cycle time that determines how quickly a unit of data can be obtained when sequential memory accesses are performed. If the RAM is 100-nanosecond RAM, for example, the cycle time is usually about 185 ns. If your PC performs two consecutive memory accesses, the first unit of data is read in 100-ns. The second, however, requires 185 nanoseconds, because the chip has to be precharged again before the access can occur.

This means that the RAM is accessed much more slowly than the rated access time would indicate, forcing the PC's designers to impose wait states on the CPU and in turn degrade performance as a whole. A typical CPU spends about 90

percent of its time accessing memory locations, so the more this access time can be pared down, the better the PC's overall performance.

Interleaved memory factors the precharge time out of the equation in sequential memory accesses by alternating consecutive memory addresses among two or more banks of RAM. In a typical arrangement on a 386, bytes 0 to 3 are located in bank 1, bytes 4 to 7 in bank 2, bytes 8 to 11 in bank 1, and so on. With this arrangement, sequential accesses can occur as fast as the chip's access times will allow, because one bank of RAM is being precharged while the other one is being accessed. In other words, the precharge time of one bank overlaps the read or write time of the other. Some of this speed is sacrificed if accesses are performed a byte at a time or a word at a time rather than 32 bits at a time, but keep in mind that CPUs spend about 70 percent of their time performing code fetches, and these are done 32 bits at a time. As a result, interleaving addresses this way can easily speed up memory accesses by 50 percent on the average, and therefore eliminate wait states that would otherwise be imposed on the CPU.

There are other memory architectures that provide even more dramatic speed increases. One commonly used in 386 PCs is called *page-mode RAM*. In a page-mode system, memory is organized into units called *pages*. Once an access is performed on one location within a page, subsequent accesses within the same page can occur without wait states, thanks to the nature of the RAM chips and special circuitry supporting them on the system board. The first 386 PC—the 16-MHz Compaq Deskpro 386—used a page-mode RAM architecture with memory divided into a series of 2K pages. The 20-MHz IBM Model 70 also uses page-mode RAM, as do a variety of 16- and 20-MHz 386s.

Short of supplying a 386 with fast (and expensive) static RAM capable of divulging data as fast as the CPU can ask for it, the next-most-desirable memory architecture is one that uses a static RAM cache. RAM caches, common in 386s running at 25 MHz and higher, buffer data going to and from the RAM subsystem the same way a disk cache buffers data going to and from the hard disk. The RAM in the cache is accessed at zero wait states. On a typical system, 90 percent or more of the read requests are delivered

Tutor

from the cache, allowing the PC to operate with an effective number of wait states that approaches zero. Only when a unit of data must be obtained from outside the cache are wait states imposed at all. The 486 has an 8K static RAM cache built-in. That's one of the factors that accounts for the speed difference between a 386 and a 486 machine running at identical clock speeds.

One of the best articles I've ever seen detailing the differences among the vari-

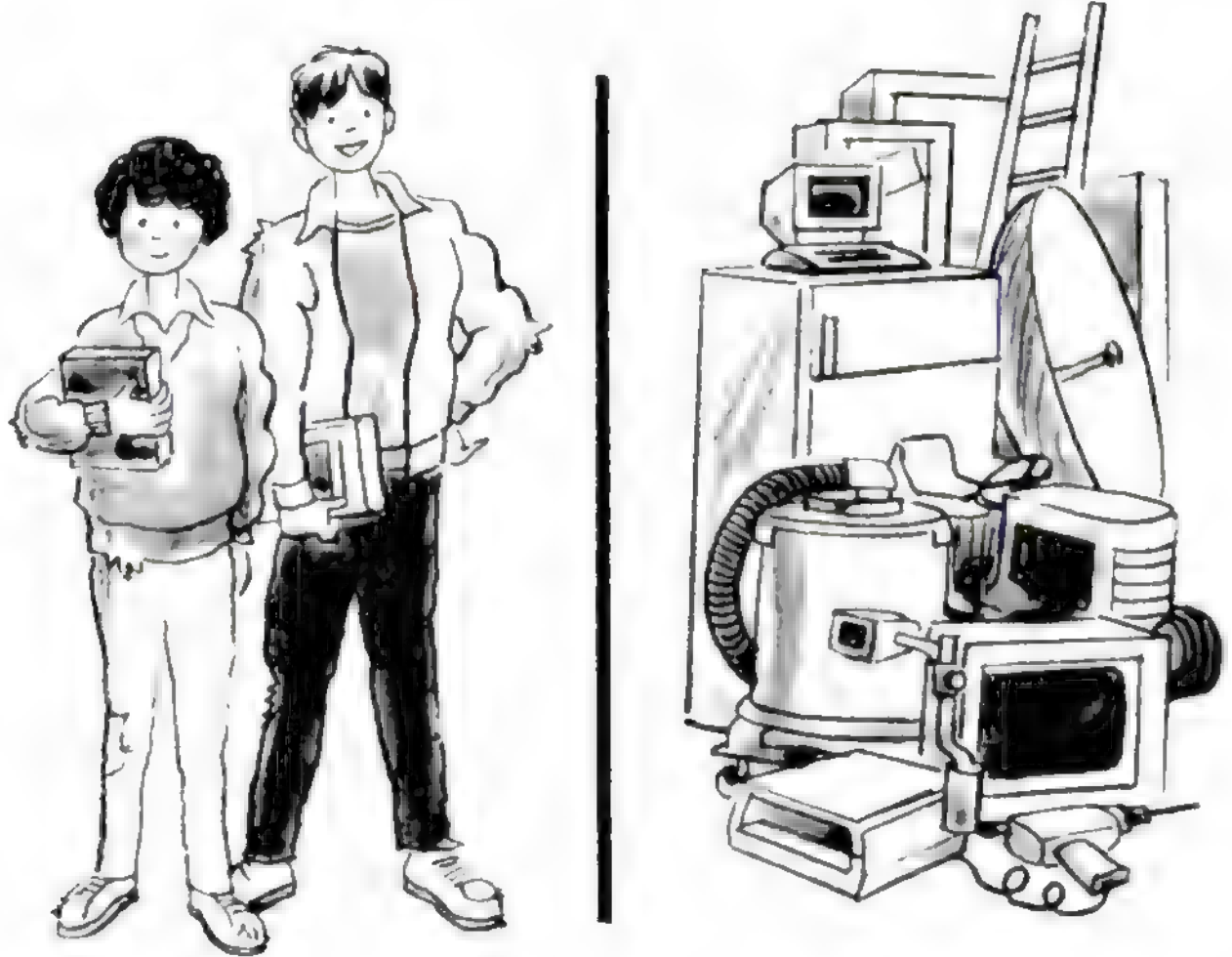
In a page-mode system, once an access is performed on one location within a page, subsequent accesses within the same page can occur without wait states.

ous memory architectures ("Memory in the Hot Seat") appeared in the February 1988 issue of *PC Tech Journal*, *PC Magazine's* one-time sister publication, which is no longer in existence. If you can get a copy (or find it on PC MagNet by typing GO COMPDB), you can gain a deeper understanding of how these schemes for eliminating wait states are pulled off, and how much of a bottleneck a slow memory subsystem can be to a fast CPU.

ASK THE TUTOR

The Tutor solves practical problems and explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. Send your question to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload it to PC MagNet (see page 10 for instructions). We regret that we cannot acknowledge submissions or answer questions individually.

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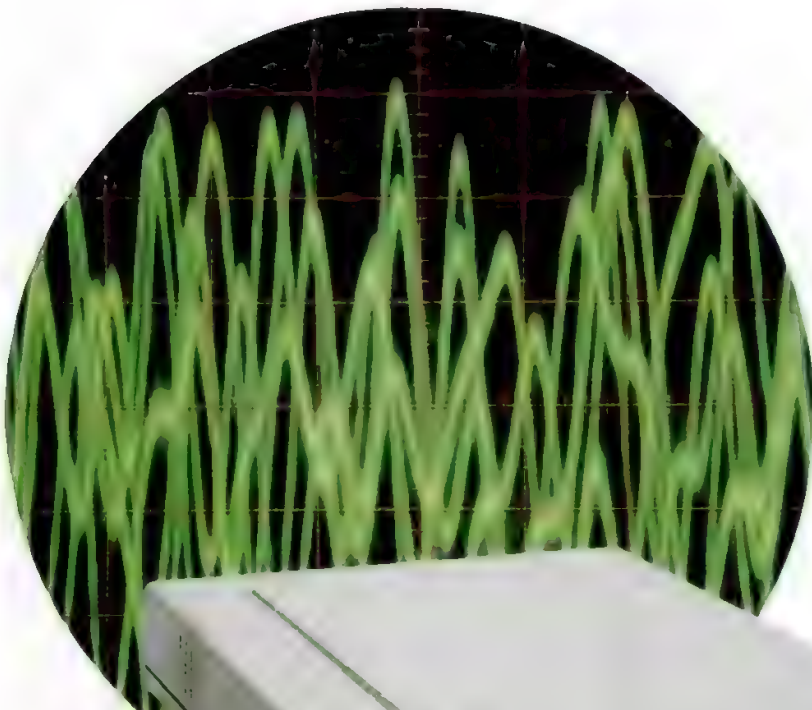
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by
Frank J. Derfler, Jr.

Connectivity

LINKING PCS

We want to share a database application written in *Clipper* between a remote machine and a local PC, both located within the same metropolitan area. The application is set up with multiuser file and record locking to allow two or more programs to share the data at the same time. Right now, we have only one PC in each location, a 386 at the local site and a 286 at the remote site. Neither machine will be used for much else besides this application.

We tried using *Carbon Copy Plus*, but that only gives us remote or local use, and we need simultaneous access.

Would the new *NetWare* 2.2 for five users work in this situation? Would we have to set up a dedicated communications server at the local site? What if we want to add other single-user sites in the future? Because the "network" is so small, would *LANtastic* be more appropriate?

Jess Bolanos
Laredo, Texas



You don't need a LAN at all! Setting up a network—whether *NetWare* or *LANtastic*—and then remotely controlling the networked PCs is overkill for what you want to do. You need a true multiuser, multitasking operating system running separate DOS sessions on the local PC. Fortunately, there are several good products available. The multiuser DOS solution is simple, low cost, and effective. Here's how it works.

You can use any of the popular multiuser DOS operating systems such as Concurrent DOS from Digital Research, PC-MOS Multiuser from the Software Link, or Alloy's 386/MultiWare on your 386. Any one of these lets you set up multiple separate DOS sessions on a 386-based PC. You'll want at least 8MB of RAM and a good disk cache.

You can run your database application in all sessions and the applications will share the file access according to the scheme you programmed with *Clipper*. In some sessions you can run *Carbon*

■ **LINKING PCS:** You don't always need a network to connect your computers.

■ **PRIMITIVE PRINT SERVICES:** The lack of a widely implemented protocol for printer communications hampers *NetWare* printing services.

■ **CREATING AN ELECTRONIC INBASKET:** Here's an easy way to let *NetWare* users exchange files.

■ **EFFECTIVE POWER:** Some devices don't make the most efficient use of applied power.

Copy Plus or any other modem remote-control program you want. The remote PC can control these sessions over a telephone line and modem just as if the sessions were on separate PCs.

You'll want to equip the local PC with a smart multiport serial adapter like the Hayes ESP to handle the communications tasks so that the processor isn't slowed down by the need to service interrupts from the serial ports.

This setup should easily provide four or more remote sessions and a local session without the need to buy another PC for the local site. Call the Multiuser DOS Federation at 800-777-MDOS (6367) for more information.

PRIMITIVE PRINT SERVICES

My department uses Macintosh computers with Apple LaserWriters. We've just merged with another group that uses PCs and HP LaserJets on a Novell *NetWare*

network. I'm amazed at how primitive the interface to the printer is under *NetWare*. What's the reason for this?

Mort Wilson
San Francisco, California



There's no doubt that Apple's printers communicate better with their client computers than printers typically used with PCs running DOS, and for good reason—Apple owns and controls all of the elements of the Macintosh network print services. The AppleTalk Printer Access Protocol provides a standardized way for printers to communicate with client computers regarding fonts, paper handling, and error conditions. Since printing is so important, a similar set of standards for printer communications should exist in the DOS, *NetWare*, and *LAN Manager* markets.

Novell has published a set of specifications called the RPrinter protocol, describing how bidirectional communications should work between a print server and printer, but even these specifications don't have the degree of detail printer manufacturers need to feel comfortable. Companies making printers and the software to drive printers want to know they aren't out there all alone when they write to a specific interface. So until the manufacturers come up with a better standard or further define and support Novell's RPrinter, you won't see the elegance and functionality of the Apple Macintosh printer interface duplicated on networked PCs running DOS.

CREATING AN ELECTRONIC INBASKET

In response to your request for "hints for improving the Novell menu system" in the July 1991 issue, here's a system we use for exchanging information. I call it the InBasket.

The system provides each user with an InBasket in which other users can put files. Novell's Menu automates the system and provides a user-friendly inter-

Connectivity

```
PUTFILE.BAT  COMPLETE LISTING
REM ***** PUTFILE.BAT *****
CLS
COPY %1 \WORK\%2\INBASKET
ECHO OFF
IF NOT EXIST %1 GOTO PROBLEM
ECHO ON
SEND "Check InBasket for %1 Please" %2
GOTO EXIT
:PROBLEM
ECHO Problem With Putting File
ECHO Please Check Your Screen
:EXIT
PAUSE
```

Figure 1: This batch file lets one user send a file to another's InBasket, and notifies the latter that something has been received.

face. Included in the system are an automatic notification message sent to the receiver, and a login alert if the user's InBasket is not empty.

Here's how to set up the system: First, create an INBASKET subdirectory for each user in his or her own directory. Then, using Novell's Filer program, give the group EVERYONE Open, Write, Delete, Modify, and Create rights to each InBasket directory. Note that EVERYONE has rights to copy files into INBASKET, but not to see what is there. Next, create a batch file called PUTFILE.BAT (Figure 1) and place it in the Novell PUBLIC subdirectory.

Two parameters are passed to PUTFILE: the filename and the UserName of the recipient. The batch file checks that the specified file exists and then sends a message to notify the receiver of the incoming file. If the user is logged in, the message will be displayed on the screen.

Now create the menu option "Put a File in an InBasket" like this:

```
P. Put a File in an InBasket
\SYSTEM\BAT\PUTFILE %1"File
Name" %2"To UserName"
```

```
M.BAT  COMPLETE LISTING
REM ***** M.BAT *****
ECHO OFF
CLS
SET USERNAME=SFLEMING
F:
CD \WORK\%USERNAME%
IF NOT EXIST \WORK\%USERNAME%\INBASKET\*. * GOTO MENU
ECHO OFF
CLS
TYPE \SYSTEM\MENUS\INBASKET.MSG
PAUSE > NUL
CLS
:MENU
MENU \SYSTEM\MENUS\%USERNAME%
```

Figure 2: This batch file executes a user's personal menu.

You must set up a personal batch file directory for each user and MAP the directory as a search drive in the login script. Then create M.BAT (Figure 2) in this directory to execute the user's personal menu. In each M.BAT file, a DOS environment variable USERNAME is set to UserName (which should match the name of the user's personal subdirectory). Since the batch file is in the search path, the user can simply enter M to bring up the menu after exiting to DOS.

To facilitate notifying users who are not logged in at the time a file is transferred, and to encourage users to keep their InBaskets cleaned out, the program checks the contents of the InBasket and notifies the user if it's not empty via an ASCII text file called INBASKET.MSG. To complete the process, the last line in the login script should be EXIT "M" to run M.BAT.

The complete system includes an InBasket submenu with options to View, Erase, and Get files in the InBasket as well as to List all users who have InBaskets. For easy maintenance, we've centrally located all user subdirectories in the same directory on the same server.

Stephen Fleming
Marshall, North Carolina

 This system (which combines environment variables, the Novell Menu utility, and batch files), is written for *NetWare* environments; however, the concept isn't restricted to *NetWare*. The menu system entry simply launches PUTFILE.BAT with the filenames and user names. The SEND command in PUTFILE is Novell-specific, but other LAN operating systems have a similar network broadcast command. Note that the SEND command won't work if users include the CASTOFF command in their login scripts or batch files.

EFFECTIVE POWER

Some UPS systems and most computer systems are rated in watts. Most UPS systems and a few computer systems are rated in volt amps. You've written about these terms as they relate to the use of UPSs on LANs, but you've never explained the difference.

Bell Jordan
Raleigh, North Carolina



Like so many descriptions of product features in the UPS market, the difference between ratings in volt amps (VA) and in watts is as much a matter of marketing as of technology. In a marketing sense, a small UPS device can be said to put out more VA than watts. And in a technical sense, the VA rating system is more accurate because the true maximum output of the UPS is limited by its output current capacity, which is directly related to the VA rating.

In resistive devices like light bulbs, the voltage and current are in phase and the device makes full use of the power applied. But when devices show an inductive or capacitive component to the power line—and most electrical devices do—the voltage and current get out of phase and the devices don't make the most efficient use of the applied power.

A number called the power factor describes the phase relationship. The power supplies in PCs typically have a power factor of about 0.6. If you have a PC with a rating in watts and a UPS rated in VA (which is the typical case), use the formula $UPSVA = PCWATTS / .6$. If your UPS is rated in watts, it's safest to assume that the manufacturer really used VA. And as a very broad rule of thumb, if $UPSVA = PCWATTS$, that is, if the rating of the UPS in VA is the same as the rating of the computer in watts, you won't have any problems.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay \$50 for any tip we print. Please submit your letter on-disk along with a printout. Then mail your contribution to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016. You may also contact Frank J. Derfler, Jr. via MCI Mail (MCI ID: 240-2931) or the LAN Labs fax machine (904-837-0737). We regret that we're unable to acknowledge submissions or answer letters individually.

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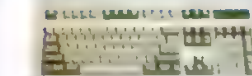
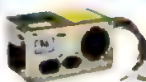
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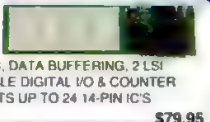


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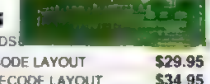
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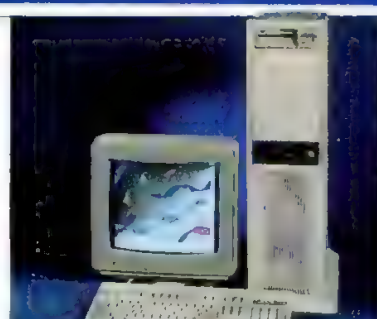
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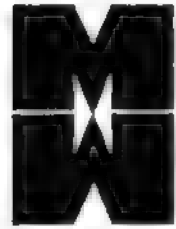
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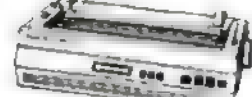
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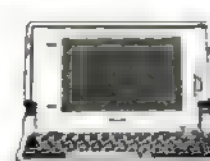
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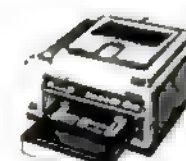
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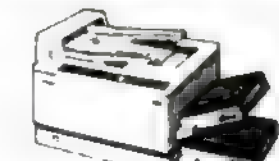
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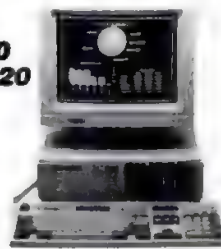
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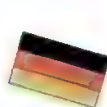
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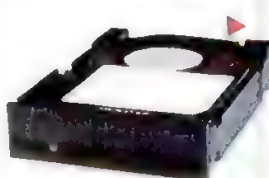
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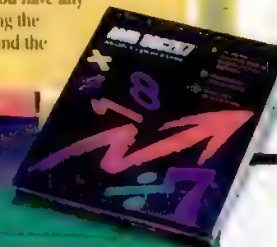
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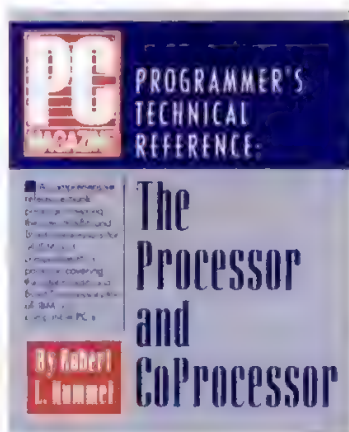
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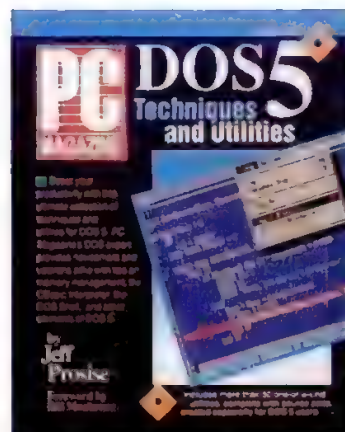
by Michael E. Kolowich

Foreword by Scott Cook, founder and president of Intuit Software

PC Computing's founding publisher and columnist Michael E. Kolowich gives you the insider's view on how to get the most out of Quicken 5.0. In a clear, easy-to-follow style, this practical guide takes you step-by-step through successful strategies for managing your finances, offering many time and money saving tips.



PC Magazine has put together the indispensable sourcebook for programmers in this comprehensive reference. Expert Robert Hummel covers the evolution, architecture, and programming of Intel's 80x86 and 80x87 processors, and includes the latest information on the 80486. Filled with explanations, diagrams, and references, this book is the ultimate processor handbook for programmers of all skill levels.



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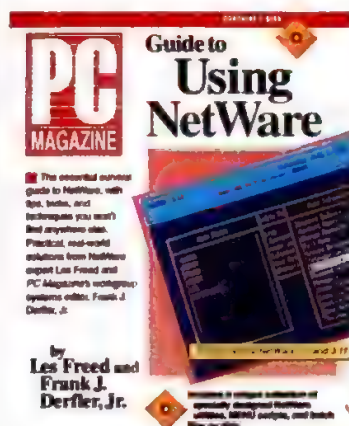
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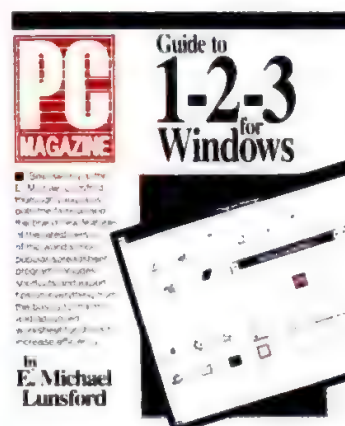
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by
Joe Salemi

Advisor

Help for Readers Making Personal Computer Decisions

SQUEEZING MORE ONTO A HARD DISK

I recently purchased the new Compaq LTE 386s/20. However, after a few weeks use, its 60MB hard disk is already full. It is stunning that any program nowadays takes 10MB of disk space!

Is there a way to add more hard disk space? I have Xircom's Pocket Ethernet Adapter, but I cannot be on the network all the time. Neither do I want a desktop expansion base. I might want to carry a small external 3.5-inch 200MB hard disk, if I could only interface one with the Compaq. Is anybody manufacturing SCSI adapters for parallel ports, or better still, for Compaq's fast proprietary expansion port?

Hannu Saarenmaa
Helsinki, Finland



You're in luck; the T338 MiniSCSI (Trantor Systems, Ltd., Fremont, CA 94538; 510-770-1400; \$179) is a parallel port SCSI adapter that also lets you continue to use the parallel port for printing. It includes software support for High Sierra CD-ROM drives and virtually all SCSI hard disks. The device driver for the adapter takes from 10K to 13K of RAM, depending on the number and type of attached devices.

There's an alternative to having to carry around extra equipment with your notebook, though: There are a couple of software programs that in various ways reduce the amount of disk space taken up by data and program files. One type of utility virtually doubles the amount of storage on your hard disk by compressing the data and changing the way it's stored. The first of these is *Stacker* (Stac Electronics, Carlsbad, CA 92008; 800-522-7822, 619-431-7474; \$149), which uses approximately 30K of RAM, and includes disk caching

software. Stac also has an ISA hardware board (also called *Stacker*) that increases performance, and works in any 8-bit slot without requiring cables or the use of a hardware interrupt (IRQ). The *Stacker* software is included with the board, and takes only 21K of RAM when used with it.

Another software solution is *SuperStor* (AddStor Inc., Menlo Park, CA 94025; 800-732-3133, 415-688-0470; \$120). It takes approximately 32K of RAM, and provides real-time compression and decompression of the data stored on hard disks and floppies; it also includes a disk defragmenting program. A version of *SuperStor* is included with Digital Research's DR DOS 6.0.

These programs and the parallel port SCSI adapter work with *Windows* 3.0, and the drivers can be loaded into the upper memory blocks provided by MS-DOS 5.0, DR DOS 6.0, and other memory management utilities. However, you should exercise some caution when using a data compression utility; it works by converting the

way data is stored on your disk, and DOS disk utilities such as disk defraggers and unerase programs may no longer function properly. Also, you won't be able to access the data on your hard disk if you boot from a floppy disk that doesn't load the software driver, and neither product supports or works under OS/2 at this time. It's always a good idea to make a complete backup of your hard disk before installing one of these programs (in fact, it's a good thing to do before installing or using *any* program that directly modifies how the data is stored on your hard disk).

A review of disk compression software is scheduled to appear in an issue of *PC Magazine* early next year.

Another alternative is a utility that compresses individual files. The advantage to this approach is that only the files themselves are modified; the data format of the disk remains DOS and OS/2 standard. Prominent among these are the file archiving utilities such as LHARC, PKZIP, and ARC.

These utilities compress files and store them in libraries, from which they can be decompressed when needed. For more complete details on these programs, see the recent review in the October 15, 1991, issue.

There are also the PCMANAGE and DCOMPRES utilities by Ross Greenberg, which were published in *PC Magazine* (December 12, 1989). PCMANAGE does the actual compression of the files, and DCOMPRES is a TSR that decompresses the files as they're loaded. Both programs are available in Library 2/PCMAG Utils of the PC MagNet Utilities/Tips Forum as PCMAN.ARC (see page 10 of this issue for details on joining PC MagNet). Finally, there are the utilities that work only on .COM and .EXE files, such as LZEXE and PKLITE.

These modify the executable files by compressing them and adding a small header that decompresses the program on the fly when it's executed; in most cases, the compressed programs are from 30 to 60 percent smaller than the original files.

LZEXE (Fabrice Bellard, France) is public domain software, and is available in Library 16/Gen Utils of the PC MagNet Utilities/Tips Forum as LZEX91.ZIP. PKLITE (PKWARE Inc., Brown Deer, WI 53223; 414-354-8599; \$46) is shareware, and is available in Library 8/ASP Utils of the Utilities/Tips Forum.

It's important to note that the utilities that compress executable files may not be successful on all programs, particularly those that use overlays (though both LZEXE and PKLITE will warn you before attempting to compress a program that might present problems). I can't stress enough that you should do a complete backup of your hard disk

- **SQUEEZING MORE ONTO A HARD DISK:** Solving "disk cram" on laptop and notebook systems.
- **GETTING DDIR TO WORK WITH DOS 5.0:** Is there an updated version of DDIR that supports DOS 4.x and 5.0?
- **WHERE'S FASTTRAX:** Tracking down the vendor of the *FastTrax* disk defragger.
- **BROTHER DATA CONVERSIONS:** Converting data from a dedicated word processor to the IBM PC format.
- **SENDING A FORM-FEED:** How to eject pages after a Print Screen.
- **UPDATES:** New info on previous answers.

Advisor

before using *any* of these utilities, and you should never use them on your program's original distribution disks.

GETTING DDIR TO WORK WITH DOS 5.0

Please let me know whether you have an update of your wonderful DDIR.COM available, as the version I have dates from September 5, 1985, and it does not work properly with DOS 4.01. The volume name and some other information is interspersed with the file listings in a rather confusing way.

Michael Simon
Beloit, Wisconsin



A number of readers have asked about an update to *PC Magazine's* DDIR.COM, both for DOS 4.x and MS-DOS 5.0.

DOS 4.0 changed the way DOS lists directories, which "broke" DDIR's method of sorting the listing prior to display.

A helpful reader examined the original source code and created an updated version of the program called DDIR4.COM. This version is compatible with all versions of DOS 2.x through 5.0, and is available as DDIR4.ARC in Library 2/PCMAG Utils in the PC MagNet Utilities/Tips Forum.

WHERE'S FASTTRAX?

A while back, a disk optimizer called *FastTrax* was a *PC Magazine* Editors' Choice. I got it, and use it periodically. I just upgraded to DOS 5.0, and I'm concerned about whether it will work under the new DOS version.

I tried to contact the vendor, Bridgeway Publishing Corp. in San Rafael, California, but they seem to have disappeared. Do you know what happened to them, or how I can reach them for advice on using *FastTrax* with DOS 5.0?

Stephen Ferg
Arlington, Virginia



They didn't disappear, Stephen—just changed their name and moved. The company is now called *FastTrax International*, and it's located in Novato, CA 94949 (415-883-9561). The current



DDIR shows a double directory from a DOS prompt. A new upgrade solves a compatibility problem with DOS 4.0 and 5.0.

version of *FastTrax* is 4.0, and is available for \$69.95; an upgrade from prior versions is \$25 (plus \$5 shipping and handling). I spoke with the technicians there, and they assured me that all 3.x and 4.x versions of the program are compatible with MS-DOS 5.0. *FastTrax* was last reviewed in the June 26, 1990, issue of *PC Magazine*.

BROTHER DATA CONVERSIONS

I am working with a Brother WP-500 and have a number of 3.5-inch floppy disks containing data I have saved. The disks have been formatted for the WP-500. How can I transfer this data to other disks for use with another computer (IBM compatible)? I trust you can help me or refer me to another source other than Brother Corp.

Julian D. Morse
Tallahassee, Florida



There are a number of vendors that specialize in converting data from one format to another; among them are 1st Run Computer Services Inc. (New York, NY 10001; 800-833-2207, 212-779-0800), Total Service Conversions Inc. (Los Angeles, CA 90027; 800-526-6878, 213-669-8134), and Conversion Specialists (El Segundo, CA 90027; 800-825-0540, 213-545-6551). While none of the vendors explicitly name Brother word processors as supported (the most common conversions are for IBM Display Writers, Wang,

Xerox, and DEC systems), they all offer a free test conversion.

In most cases, they're also willing to do a one-time custom conversion (though this may only make sense to do if you have a large amount of data to convert).

SENDING A FORM-FEED

We have many Hewlett-Packard Series II printers in our offices. Some are shared by up to four PCs through ESI's *ShareSpool*. Is there any way on the standalone and the shared printers to eject a page after a user has printed a screen? A batch file would be ideal.

Valentina Jaroszenko
Chicago, Illinois



The form-feed character is ASCII character 012 decimal, or Ctrl-L, and appears in ASCII documents as either the scientific symbol for "female" (♀) or the text "^L". There are a number of ways you can send this character to the printer.

The simplest is to use the DOS COPY command to redirect the keystrokes out to the printer port. Just do the following:

- 1) At the DOS prompt, type COPY CON PRN.
- 2) The cursor will be on a blank line. On this line, hold down the Ctrl key, and type L then Z. (The ^Z character signifies the end of the ASCII file to DOS.)
- 3) Press the Enter key. You'll get the message "1 File(s) Copied", and the page will eject.

Now, for repeated use, just

change the PRN in the COPY statement to FF; this will create a small file in the current directory that contains nothing but the command (you should do this in a subdirectory, such as your DOS directory, if only to keep the root directory uncluttered). You can then either copy this file to the printer manually (COPY C:\DOS\FF PRN), or create a FF.BAT batch file that contains the same command.

The easiest solution, though, is a TSR program that monitors the keyboard and issues a form-feed automatically after the Print Screen key is pressed. PRTSCF.COM is a tiny (128-byte) program that does just that, and is located in Library 16/Gen Utils of the Utilities/Tips Forum on PC MagNet.

UPDATES

In the June 25, 1991, issue, I responded to a question from Dan Bunnell regarding the stock quote program *Live Wire*. A number of readers wrote in to let me know that the company had moved. The new address is: CableSoft Inc., Lenexa, KA 66214; 913-888-4449. There are now two versions of *Live Wire*; a personal version for \$295 and the professional version for \$595. The latest versions now support data from DTN Wall Street and X*Press, as well as FNN.

In the same reply, I identified *Signal* as a Lotus Development Corp. product; Lotus has sold *Signal* to Data Broadcasting Corp. DBC can be reached in San Mateo, CA 94403 at 415-571-1800. My thanks to all who provided this information.

In the May 28, 1991 column, I discussed music cards for PCs, and identified Roland as the only vendor with a version for the PS/2 bus. Since that time, AdLib Inc. (Boston, MA 02114; 800-463-2686) has released a version of its music card for MCA systems; it retails for \$219.95.

ASK THE ADVISOR

Send your question to PC Advisor, One Park Avenue, New York, NY 10016, MCI mailbox PC MAGAZINE, or upload it to PC MagNet (see the instructions for joining on page 10 of this issue). Sorry, but we cannot send personal replies. ■

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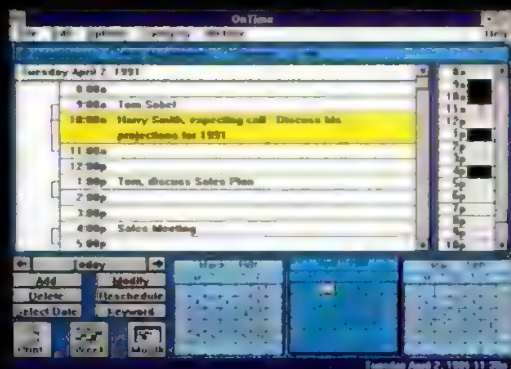
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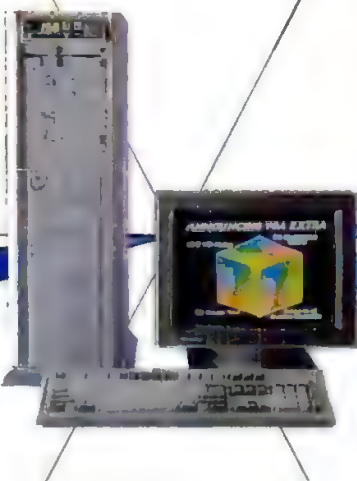
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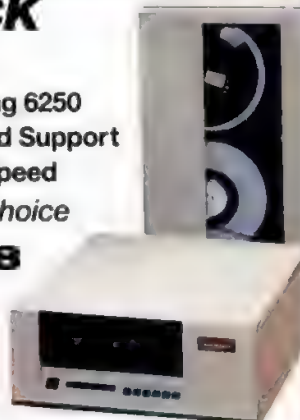
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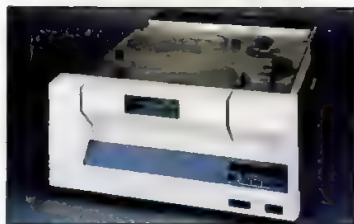
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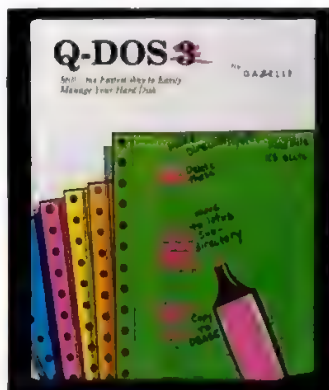
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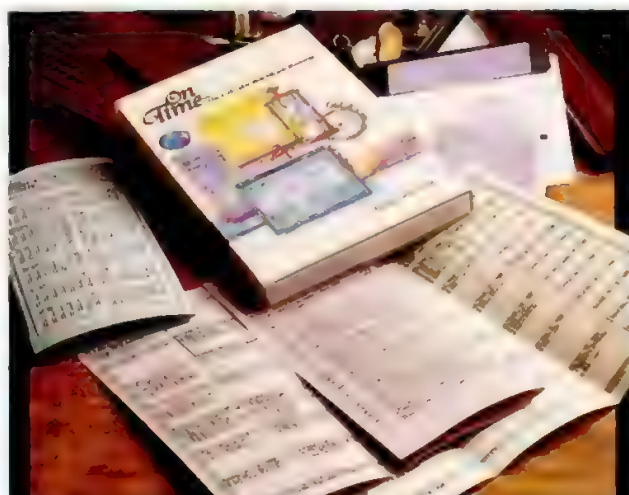
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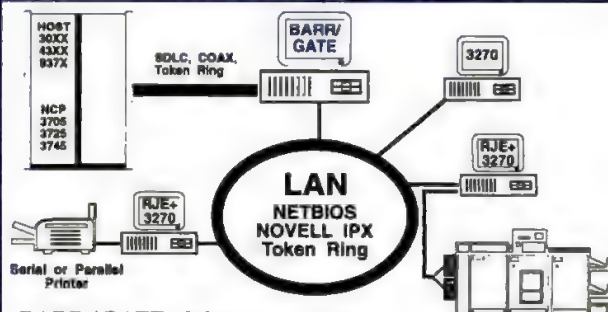
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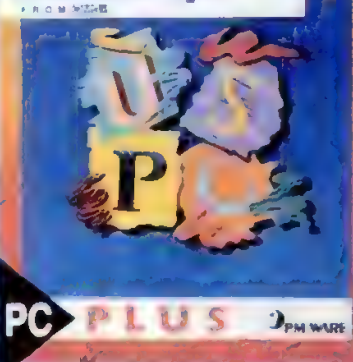
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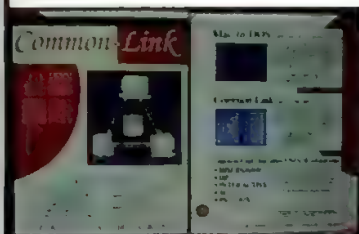
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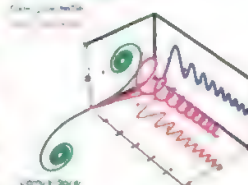
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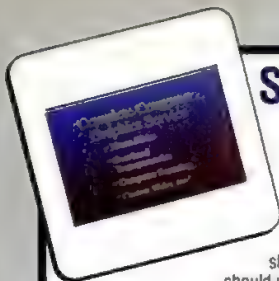
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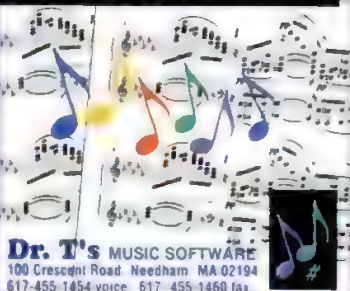
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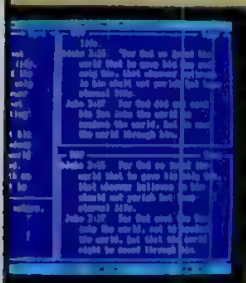


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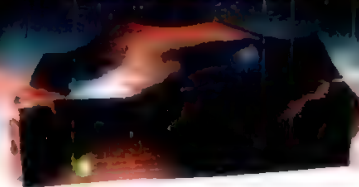
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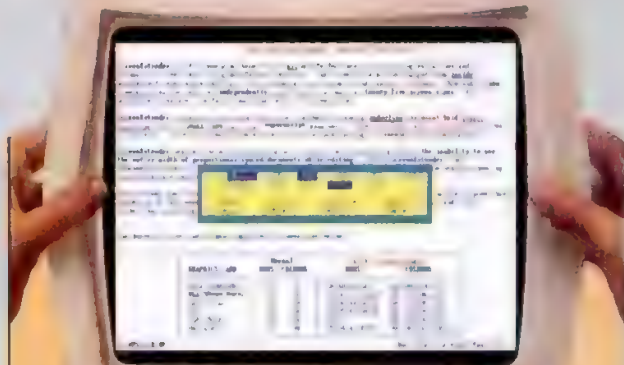
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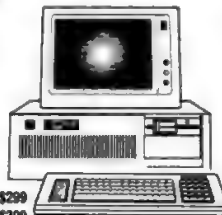
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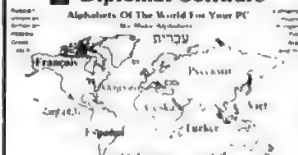
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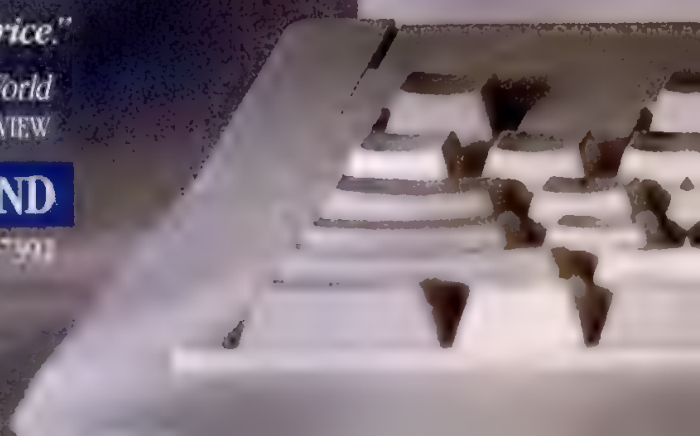
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TECHNICAL EXCELLENCE

PC Magazine reveals the winners of its annual Technical Excellence awards, selected by the editors from the flood of new hardware and software products introduced in the past year. Recognition is given to the products and people who have made the greatest impact on the industry in this tumultuous year.



SPREADSHEET SHOWDOWN

Spreadsheets, the programs that helped start the PC revolution, enter their second decade more full-featured than ever. PC Magazine Labs tests ten of today's top spreadsheet programs for both DOS and Windows, including *Microsoft Excel 3.0*, *Lotus 1-2-3* for DOS 2.3, *Lotus 1-2-3* for DOS 3.1 Plus, *Lotus 1-2-3* for Windows, *Quattro Pro 3.0*, *SuperCalc*, and *Wingz*, and our suitability to task ratings pinpoint the packages best equipped for charting, worksheet publishing, consolidation, and interoperability.

CD-ROM NETWORKING

The connectivity team looks at a variety of products that let you network your CD-ROM drives. Networking these drives provides multiuser access to CD-ROM applications—some of a company's most expensive data investments—without the trouble and risk of passing them from desktop to desktop. In this article, we look at both software-only and software/hardware combinations, reviewing offerings from CBIS, Corel Systems Corp., Meridian Data, Micro Design International and Online Computer Systems. Sidebars will detail several DOS-based LAN operating systems that also provide CD-ROM networking capabilities, as well as the pros and cons of using CD-ROM "jukebox" minichangers on the LAN.

HARD DISKS

Need to bring your old hard disk into the shop for a cheap fix? Or are you just in the market for a modest upgrade? With the economy the way it is, you may not want to do either. Buying a new hard disk is now the thriftier move. New 40 megabyte hard disks are now selling for under \$200; you can even find 60-80 megabyte hard disks for under \$300. PC Magazine looks at new hard disk features: sleek sizes, snappy speeds, and prices that relieve the recession crunch. Also, tips on protecting your current hard disk, how to tell if it's really damaged or not, and what to look for in interface options.

20 MHZ 486SX PCs

Intel's 486SX chip remains at the center of a controversy: Will this processor become the new entry-level chip for business, or will it fade into history as a low-priced but crippled processor? More than 30 vendors have announced plans to ship systems based on the 486SX processor, essentially a 20-MHz 486DX without the coprocessor. PC Magazine Labs tests 19 products to see how they stack up against the 386 and 486 competition.

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548	Tracon II	Wesson International	507	DEPARTMENT				Windows	Change the colors of Windows Help text to make it more readable.		409
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627	IBM PS/1 Model 2121B82	IBM Corp.	182	DEPARTMENT				Databases	A procedure that lets you delete files with wildcards in FoxPro.		413
706	PS/2 Ultimedia Model MS7 SLC	IBM Corp.	35	DEPARTMENT				Spreadsheets	Two 1-2-3 macros that generate random numbers between two limits.		415
628	PC Partner XI	Leading Technology Inc.	184	DEPARTMENT				Spreadsheets	Turn spreadsheets into management tools with Excel's format Patterns command.		415
629	Magnavox Headstart SX-20 CD	Philips Consumer Electronics Corp.	193	DEPARTMENT				Spreadsheets	Change Symphony's colors with a Lotus 1-2-3 trick.		415
630	Samsung Sensor SP-386SX	Samsung Information Systems America Inc.	200	DEPARTMENT				The Working Word	A Macro that shows you how to run macros designed for standard short names.		419
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705	4033 LX Multimedia	Tandy Corp.	35	DEPARTMENT				User-to-User	A clever trick lets you hide part of your hard disk.		421
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423	Prompt, Version 2.0b	Access Softek	300	DEPARTMENT				Tutor	How faster RAM accesses are achieved.		429
542	Tree86, Version 3.21	The Aldridge Co.	300	DEPARTMENT				Connectivity	Linking PCs without using a network.		433
422	askSam, Version 5.0	askSam Systems	300	DEPARTMENT				Connectivity	NetWare's primitive printing services.		433
427	Montrix, Version 2.1	Cheyenne Software Inc.	300	DEPARTMENT				Connectivity	An easy way to let NetWare users exchange files.		433
				DEPARTMENT				Connectivity	Understanding UPS power ratings.		433



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After Hours

Products for the Leisure Side of Personal Computing

An Open Letter to Santa: PC Magazine's Year-End Holiday Gift Ideas

By [Name]

During the holiday season, even the hardest-working number crunchers generally put aside their spreadsheets and turn to the cheerier pursuit of exchanging gifts. Software and hardware products of all kinds will be lovingly given and gratefully received this year; it's just one more sign of how thoroughly IBM's little invention has changed every aspect of our lives.

To help you shop for your PC-literate loved ones, we've put

together a selection of our favorites from the past year, as well as a couple of new surprises and novel ideas. There are games, simulations, and other escapist stocking stuffers. But we have also included some more serious selections, designed to educate, enlighten, and otherwise enrich the lives of lucky recipients. And as you look for ideas, don't forget to keep a sharp eye out for something that you want. Then either buy it for yourself, as a reward for all your hard work in the past year, or start hinting like mad.

monies of The Games will be simulated.

Access Software, Bountiful, UT, 800-880-4880.

CIRCLE 414 ON READER SERVICE CARD

Accolade, San Jose, CA, 408-985-1700.

CIRCLE 415 ON READER SERVICE CARD

Getting Adventurous

There is no limit to the places you can go with a PC and a little imagination; untold adventures await the gamer who surrenders to the brilliant images and rich plot lines of today's best graphical adventures. This year, Sierra On-Line lived up to its reputation as a leader in the design of complex, absorbing adventures with the release of the fifth installment of their acclaimed *King's Quest* and the fourth chapter in the loony *Space Quest* saga. *King's Quest V* (\$69.95) and *Space Quest IV* (\$59.95) both feature hand-painted, digitized

■ Our second annual holiday roundup looks back at the best products of the year and offers a glimpse of what's to come. Our selections should help narrow the search for the perfect PC gift

Angeles of the mid-21st century. A horrible new drug, MTZ, has made its way into the subculture, and the mayor's daughter has succumbed to its awful charms. You are assigned to the case, and eventually the fate of the entire city rests on your shoulders. If you falter, even for a moment, you die.

Wonderland (\$59.99), from Virgin Mastertronic, relies on

imagination instead of graphic gore. Its innovative interface marries the descriptive richness of text-based games like *Adventure* to the high-resolution images clamored for by gamers. Multiple windows display descriptive text, accompa-

KING'S QUEST V



nying visuals, and maps that automatically trace your progress through imaginative terrain drawn from Lewis Carroll's immortal *Alice in Wonderland*. All of your favorite characters, from the hookah-smoking caterpillar to the mad hatter, are there. **Sierra On-Line**, Coarsegold, CA, 800-326-6654.

For adventure of a different sort, try Dynamix's *Rise of the Dragon* (\$59.95). You are a world-weary private detective in the decadent, decaying Los

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CONTINUES

Be a Good Sport

Sports simulations are among the most popular PC-based diversions. Armchair athletes can get a taste of life in the pros against digital adversaries. One of the best simulators in recent memory is Access Software's *Links: The Challenge of Golf* (\$59.95). With its breathtaking 256-color graphics and lifelike "RealSound," *Links* comes unnervingly close to an afternoon on the...well, you know. While no computer program yet reproduces the full complexity—or

frustration—of golf, *Links* comes closer than any other simulation with its great use of scanned images and its series of add-on modules that allow PC golfers to sample some of the world's greatest courses.

Accolade plans to release *The Games: Winter Challenge*, (\$54.95) in time for the 1992 Winter Olympics. Eight different events will be represented, including cross-country skiing, downhill skiing, bobsled and luge racing, and speed skating. Accolade says the software makes use of three-dimensional

polygon graphics and 256-color bitmapped images. Up to ten players can participate; competitors can select training mode to hone their skills or go for the gold in head-to-head competition. Even the opening and closing cere-



LINKS: THE CHALLENGE OF GOLF

After Hours

Holiday Roundup

CONTINUED

Dynamix Inc., Eugene, OR, 800-326-6655.

CIRCLE 417 ON READER SERVICE CARD

Virgin Mastertronic International Inc., Irvine, CA, 800-874-4607.

CIRCLE 546 ON READER SERVICE CARD



There is a subtle distinction between PC games and full-fledged simulations. Games aim to entertain but not necessarily to enlighten, while simulations attempt to represent reality as accurately as possible. *Life & Death II: The Brain* (\$49.95), from The Software Toolworks, straddles the line between these two software genres.

With its stomach-churning VGA images of brain surgery, and its high level of medical detail, *LDII* seems almost like a surgery simulator. But the software also offers the whimsy that everyone expects from a game. Either way, it's interesting, bloody, and fun.

Tracon II (\$69.95), from Wesson International, is another software package that blurs the distinction between games and simulations. It provides a very realistic taste of life in the high-pressure environment of the airport control tower. *Tracon II* can be linked to another PC running *Microsoft Flight Simulator* (Version 3.0 or later); this adds another layer of simulated reality as the *Flight Simulator* plane appears on the *Tracon II* radar screen. Aircraft in

the surrounding air traffic sector become visible on the *FS* screen as well.

Flight Simulator junkies with Version 4.0 or later will definitely appreciate Microsoft's *Aircraft and Scenery Designer* (\$39.95). This software add-on comes with four additional aircraft not included in the original package and also generates complex scenery.

Maxis Software's *SimEarth* (\$69.95), successor to the runaway hit *Sim City*, challenges users to set up and maintain a successful planetary ecosystem. There are seemingly endless details to attend to, all of which are managed in *SimEarth*'s multiwindow interface.



SECRET WEAPONS OF THE LUFTWAFFE

The Software Toolworks, Novato, CA, 415-883-3000.

CIRCLE 547 ON READER SERVICE CARD

Wesson International, Austin, TX, 800-634-9808.

CIRCLE 548 ON READER SERVICE CARD

Microsoft Corp., Redmond, WA, 800-426-9400.

CIRCLE 549 ON READER SERVICE CARD

Maxis Software, Orinda, CA, 800-336-2947.

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Many PC gamers have a near-fanatical fascination with military hardware. Three recent combat simulations bring all sorts of flying weapons from the past, present, and future to the PC screen.

Secret Weap-

ons of the Luftwaffe (\$69.95), from Lucasfilm Games, recreates the sophisticated jet-powered aircraft that the Nazis threw into the fight in the desperate, waning days of WWII. With stunning graphics, *Secret Weapons* effectively portrays the first jet aircraft with accurate cockpit views.

Equally as frightening is the prospect of modern, nuclear-capable aircraft falling into terrorist hands in these wide-open,

post-Cold War times. *Stormovik* (\$14.95), from Electronic Arts, adds a healthy dose of world politics to the usual first-rate simulated technology.

One version of the future of aerial combat is played out in Origin System's *Wing Commander* (\$69.95), which takes the classic dogfight into outer space. *Wing Commander* is distinguished from shoot-'em-up arcade games by its outstanding 3-D graphics, complex outer space combat, and well-developed plot line.

Lucasfilm Games, San Rafael, CA, 800-7827-9277.

CIRCLE 601 ON READER SERVICE CARD

Electronic Arts, San Mateo, CA, 415-572-2787.

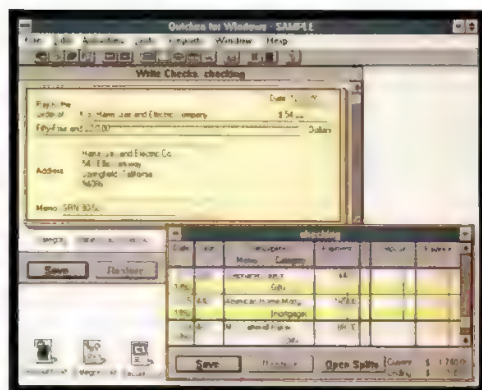
CIRCLE 602 ON READER SERVICE CARD

Origin Systems, Austin, TX, 512-328-0282.

CIRCLE 603 ON READER SERVICE CARD



With snow in the forecast and Santa loading his sleigh, April 15 may seem comfortably far off. But tax time rolls around just as surely as the holiday season does, every year. The family money manager might very well appreciate tax or fi-



QUICKEN FOR WINDOWS

nancial software to simplify the task of making sense out of your dollars.

When it comes to tax preparation software, there are two perennial favorites: *TurboTax* (\$59.95), from ChipSoft, and *Andrew Tobias's TaxCut* (\$89.95), from Meca Software. Both simplify the process of filling out your returns, and both offer copious help, not only with the software, but also with many of the tax questions that will inevitably arise.

A good companion for *TaxCut* is *Andrew Tobias's Managing Your Money* (\$219.95), also from Meca, which helps you organize your finances and plan for the future, so that your kids' tuition bills and other costs don't bury you. At the end of the fiscal year, you can dump your *MYM* data directly into *TaxCut* to simplify the preparation of your return.

Intuit's *Quicken*, the popular money management tool that manages your personal finance with a simple "checkbook" interface, now runs under *Windows*. *Microsoft's Money* (\$69.95) goes head-to-head with *Quicken* in the *Windows* arena, but *Quicken* is now available in two new versions: Version 5.0 for DOS and *Quicken for Windows* (\$69.95 each).

ChipSoft Inc., San Diego, CA, 619-453-8722.

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Meca Software Inc., Fairfield CT, 800-288-6322.

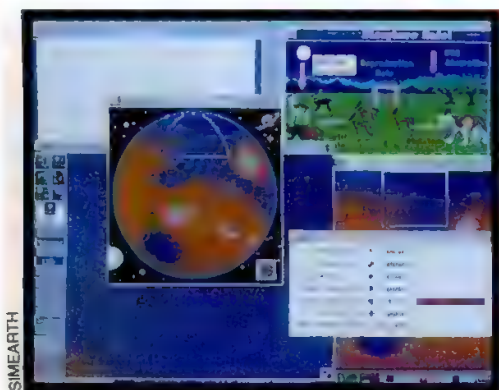
CIRCLE 605 ON READER SERVICE CARD

Intuit, San Mateo, CA, 415-358-8535.

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Microsoft Corp., Redmond, WA, 206-882-8080

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Holiday Roundup

CD or Not CD

One of the most exciting recent developments in PC hardware is the CD-ROM. Acceptance of this technology has been limited mainly by the still-high prices of the drives, but a wealth of enticing software is nevertheless available. The CD's high-fidelity sound capability and massive storage potential make it a natural, both for educational applications and as a medium for reference works.

a click of the mouse.

World Atlas (\$149.95), from The Software Toolworks, also comes on CD-ROM in its latest version. It offers more textual information than *PC Globe*, which hasn't yet been released on CD-ROM, in addition to more than 200 color maps.

Sierra On-Line's *Mixed-Up Mother Goose* (\$59.95) fully exploits the CD-ROM's multimedia potential. As youngsters play a 256-color game based on the familiar nursery rhymes, they actually hear the characters speak their lines.

Two exciting new CD's from Microsoft's Multimedia Systems Group are out just in time for the holidays: *Multimedia Beethoven: The Ninth Symphony* and *Bookshelf for Windows*. The first is an in-depth look

at the many facets of Beethoven's timeless opus, and the second is an animated/audio version of Microsoft's popular reference series.

National Geographic Society Educational Services, Washington, D.C., 800-368-2728.

CIRCLE 608 ON READER SERVICE CARD

Compton's New Media, Chicago, IL, 800-423-6397.

CIRCLE 609 ON READER SERVICE CARD

The Software Toolworks, Novato, CA, 800-234-3088.

CIRCLE 610 ON READER SERVICE CARD

Sierra On-Line, Coarsegold, CA, 800-326-6654.

CIRCLE 612 ON READER SERVICE CARD

Microsoft Corp., Redmond, WA, 206-882-8080.

CIRCLE 613 ON READER SERVICE CARD



The future of educational software may belong to CD-ROMs, but the vast majority of titles still appear on conventional disks.



CARMEN SANDIEGO

Broderbund Software's *Where In America's Past Is Carmen Sandiego?* (\$59.95) debuted not long ago, just in time to ride a wave of Carmenmania. The game comes with a copy of the book *What Happened When*, a 1,460-page edition of *The American Encyclopedia of American Facts and Dates*. Young players use the reference book to help track Carmen down.

The most recent installment in The Learning Company's super Super Solver series, *Treasure Mountain!* (\$49.95), teaches reading comprehension, spelling, math, and problem solving. But, as in previous Super Solver games, youngsters may never realize that they are playing an educational game. That's because they are too busy enjoying the colorful graphics, amusing animation, and engrossing challenges that hide the educational content.

Preschoolers will adore three new titles from Disney Software: *Mickey's Colors and Shapes*, *Mickey's 123s*, and *Mickey's ABCs* (\$39.95 each) teach early learning concepts. All have excellent Disney animation, and all use Disney's reasonably priced sound peripheral, the Sound Source (\$34.95).

Children can both develop and show off their budding creativity with Broder-

bund's *KidPix* (\$59.95), which has recently made the jump from the Macintosh to the DOS platform. *KidPix* fuses the high-tech tools found in the best paint programs with a special touch of whimsy and playfulness. All the traditional goodies are there: brushes, paints, erasers, clip art, text, and more. But they are all imbued with a touch of whimsy guaranteed to fire the imagination of young Michelangelos. Little ones will zero right in on the "wacky brush" collection, for instance. One brush simulates a leaky pen, while others draw concentric circles, fractal trees, fuzzy pictures, splatter-paint, zigzags, swirls, and even lines of alphabetical characters.



KIDPIX

Broderbund Software Inc., San Rafael, CA, 800-521-6263.

CIRCLE 614 ON READER SERVICE CARD

The Learning Company, Fremont, CA, 800-852-2255.

CIRCLE 615 ON READER SERVICE CARD

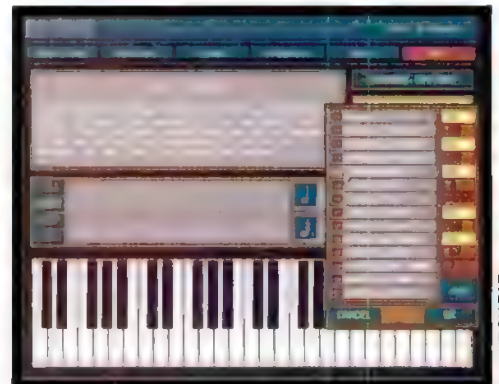
Disney Software Inc., Burbank, CA, 818-567-5360.

CIRCLE 616 ON READER SERVICE CARD



PC-based learning isn't just for the kids. Adults can find a range

CONTINUES



PLAY IT BY EAR

After Hours

Holiday Roundup

CONTINUED

of software that will guide them in the pursuit of new knowledge or skills. Ibis Software's *Play It By Ear* (\$99.95) will train your ear with patience that your piano teacher could never muster.

Quotemaster Plus, from PennComp (available for DOS or Windows, \$89 each), provides a ready source of pithy epigrams to spice up your correspondence or make you the wittiest guest at the next office cocktail party.

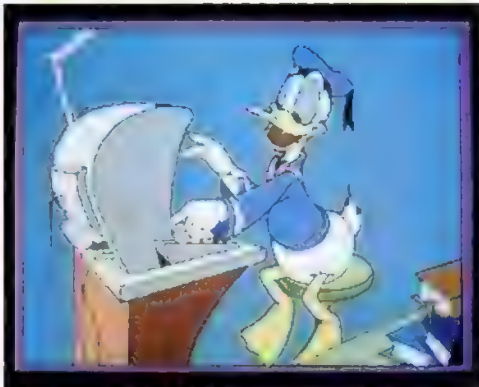
Disney Software's how-to animation pack-

age (*The Animation Studio* \$129.95) explains the basic concepts behind their famous cartoons, and even includes some classic Disney animation. Ibis Software, San Francisco, CA, 415-546-1917.

CIRCLE 617 ON READER SERVICE CARD
PennComp, Houston, TX, 800-326-6145.

CIRCLE 618 ON READER SERVICE CARD
Disney Software Inc., Burbank, CA, 818-567-5360.

CIRCLE 619 ON READER SERVICE CARD



THE ANIMATION STUDIO



A new twist in personal genealogy is provided by *Memories* (\$79.95), an oral history program that guides you in the writing of your memoirs by posing a series of focused questions about different periods on your life.

Senior Software Systems, Austin, TX, 800-637-9949.

CIRCLE 626 ON READER SERVICE CARD



The Sharper Image set will just love this year's spiffiest new gadget—Dycam's \$995 Model 1 digital camera. You operate the futuristic-looking Dycam just like any other point-and-shoot camera, but it uses memory instead of film to store your snapshots (in TIFF format). In a matter of seconds you can transfer the images to your

PC via an included cable and display them on a VGA monitor. Dycam includes *Picture Publisher*, an image manipulation package. Logitech also markets a similar but less costly version, its FotoMan Digital Camera (\$799) with *FotoTouch* image manipulation software. The company will give all users who register a free carrying case.

If you want a home computer in your future, the one to buy is Magnavox's HeadStart SX-20 CD (\$2,399 including monitor). With its 20-MHz 386SX processor, VGA graphics, internal CD-ROM drive, and 80MB hard disk, the HeadStart SX-20 CD leaves plenty of room for growth. But more important for beginners is the *GeoWorks Ensemble* operating environment that comes with the unit as well as a wealth of pre-installed software, including *Lotus 1-2-3*, Version 2.2.

One of the HeadStart's great

CONTINUES

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After Hours

Holiday Roundup

CONTINUED

strengths is the library of CD-ROM software that comes with it. The CD library includes Microsoft *Bookshelf*, The Software Toolworks *World Atlas*, an electronic encyclopedia, and several other worthwhile choices.

Dycam Inc., Chatsworth, CA, 818-998-8008.

CIRCLE 620 ON READER SERVICE CARD

Logitech Inc., Fremont, CA, 800-231-7717.

CIRCLE 621 ON READER SERVICE CARD

Philips Consumer Electronics Co., Knoxville, TN, 800-722-6224.

CIRCLE 622 ON READER SERVICE CARD



Calendars are always a popular gift during the holidays, and two in particular come to mind for computer lovers. The first is **Amaze!nc's** *The Far Side Computer Calendar* (\$69.95),

Microsoft

Windows-based calendar/personal scheduler featuring the drawings and humor of Gary Larson, as well as some surprising animated sequences. And for those of you who need to follow every development in the personal computer industry, **Tech Trade Events' 1992 Computer Events Calendar** (a conventional wall calendar for \$29.95) lists every industry forum and trade show, from New York's PC Expo to Comdex to CEBIT in Hannover, Germany, complete with quarterly updates. **Amaze!nc**, Kirkland, WA, 206-820-7007.

CIRCLE 623 ON READER SERVICE CARD

Tech Trade Events, Oakland, CA, 510-428-2439.

CIRCLE 624 ON READER SERVICE CARD



THE FAR SIDE COMPUTER CALENDAR



The holiday season wouldn't be complete without Christmas cards, and **Focal Point Greetings** offers this traditional custom with a twist: *PC Greetings* (\$7.95), a PC-based greeting card and screen saver with sound, graphics, and animation.

Focal Point Greetings, Los Altos, CA, 415-969-9609.

CIRCLE 625 ON READER SERVICE CARD

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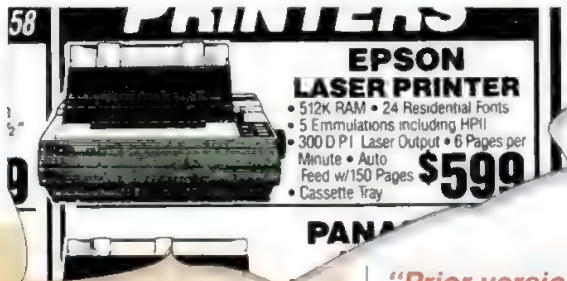
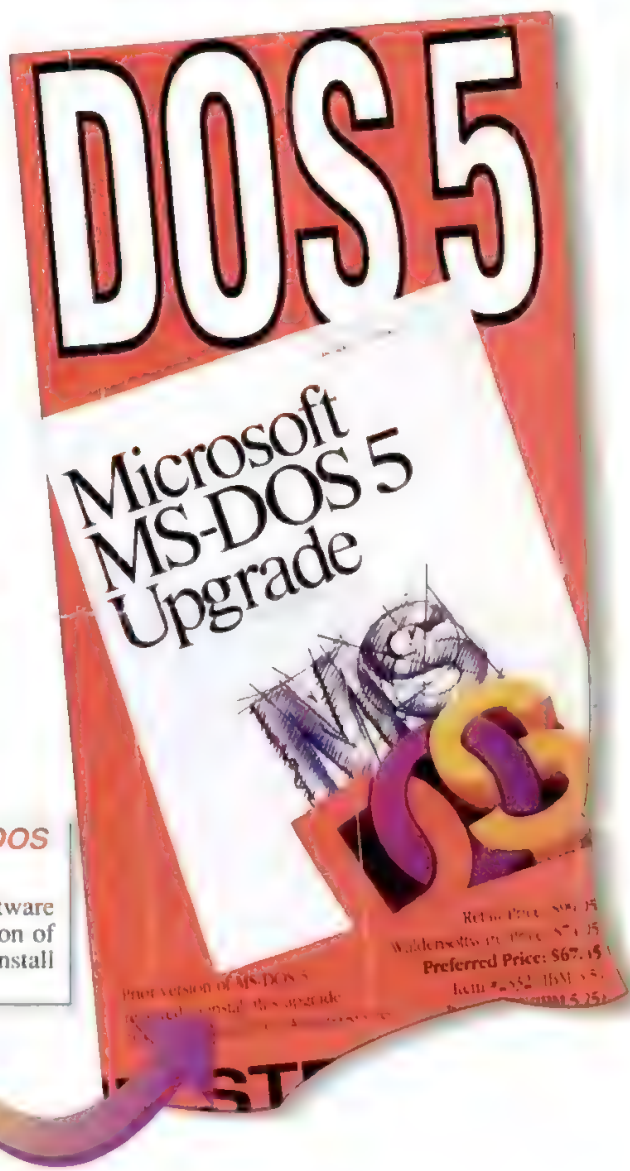
Abort, Retry, Fail?

The Lighter Side of Personal Computing



"The fast-track Desktop IV contract is being designed to give Defense Department users access to today's technology today, vendors said. Many companies predict the winning bid will include a range of PCs configured around Intel Corp.'s powerful 64-bit 486 and 486SX chips."

—Federal Computer Week,
June 3, 1991



According to Central Park Computers and Electronics of New York City, this is a laser printer with "24 residential fonts."

"Prior version of MS-DOS 5 required..."

According to this WaldenSoftware ad, you need to have a version of DOS 5 installed in order to install DOS 5.

If your entry is used in Abort, Retry, Fail? we'll send you \$50 and a PC Magazine T-shirt. Caution: In case of multiple entries, the postmark date, neatness, and completeness of each entry are considered. Winners this issue: Gregory Speth (64-bit 486), George Galdiano (DOS 5), James Requa(residential fonts).

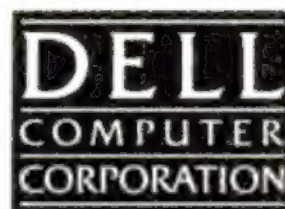
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Fax #: () _____

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|--|--|
| ☐ 286-based systems | ☐ i486-based systems |
| ☐ i386™SX-based systems | ☐ UNIX® based systems |
| ☐ i386-based systems | ☐ Laptops/Notebooks |
| ☐ i486™SX-based systems | ☐ Other: _____ |

2. Are you interested in computer products for:
- ☐ Home ☐ Business ☐ Resale

3. If for resale, please identify your primary customers:
- ☐ General Business ☐ Government ☐ Education ☐ Medical

4. How many PCs does your company plan to purchase in the next
twelve months?

Quantity	Timeframe	Quantity	Timeframe
_____	Less than 1 month	_____	6-12 months
_____	1-3 months	_____	More than 12 months
_____	3-6 months		

5. What do you plan to use computer products for?
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6. How many PCs do you have installed now at your company?
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7. Are you interested in leasing? ☐ Yes ☐ No

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|--|--|
| ☐ 286-based systems | ☐ i486-based systems |
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| ☐ i486™SX-based systems | ☐ Other: _____ |

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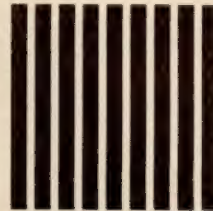


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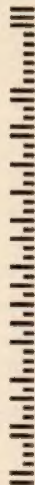


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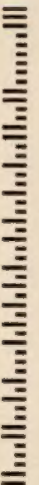


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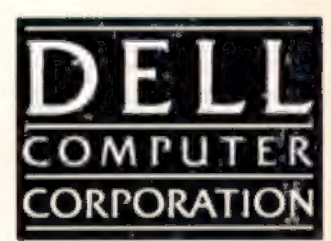


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